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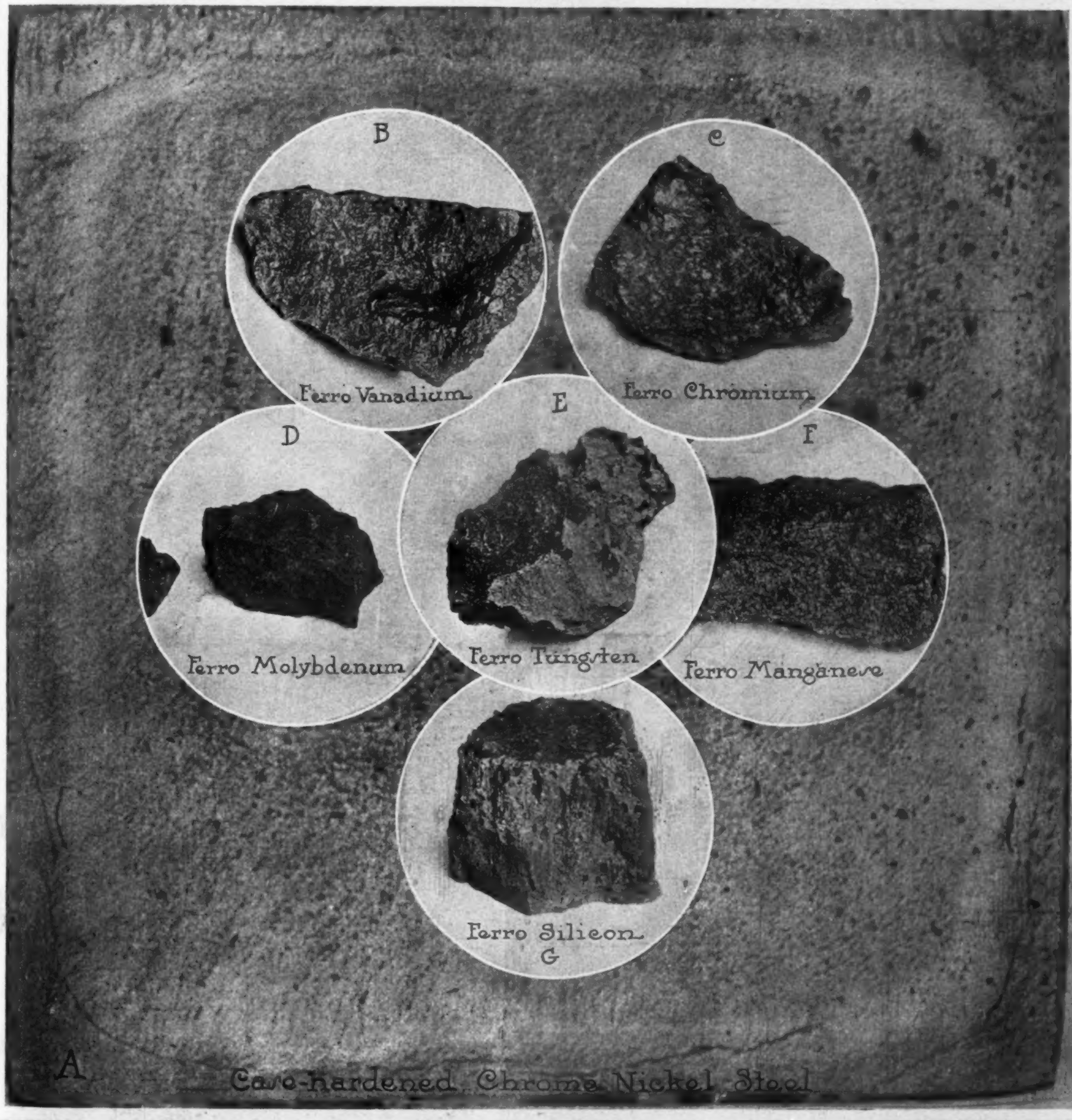
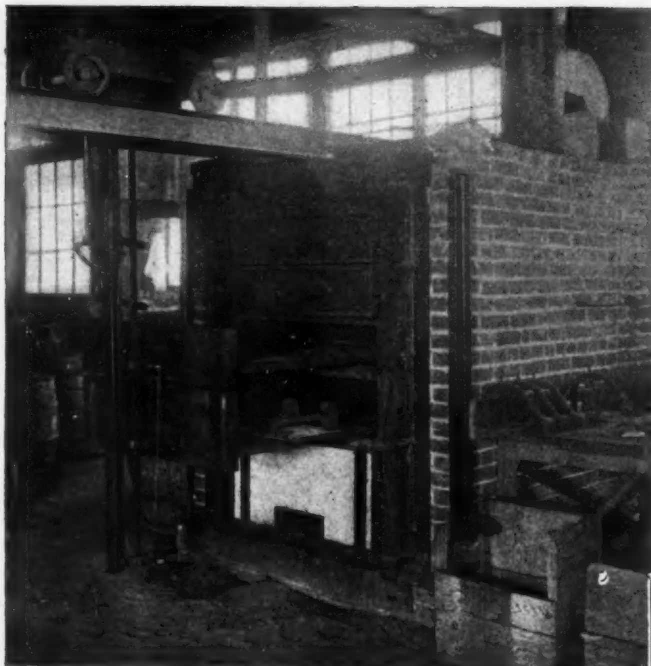
THE AUTOMOBILE

PROBLEMS OF STANDARDIZATION



PROGRESS in the automobile art has been so rapid that the questions of standardization have been handled as the natural result of practical effort without any attempt to direct the issue. In some ways it has proven to be advantageous to "cut and try" rather than to fix upon a standard only to find as the result of practice that the standard itself was cramped. Within the year the leading engineers, realizing the short-comings of a too rapid growth, took the time to assemble at Detroit,



under the auspices of the Society of Automobile Engineers, devoting themselves to the good of the industry, with particular reference to the questions of standardization. Excellent headway was made and a plan of campaign was mapped out such as should resound in the building of better automobiles, with a two-fold direct advantage, *i. e.,* (a) the elimination of extravagances in the various manufacturing processes, and (b) the purchase and use of more appropriate and regular grades of raw material.

Many of the problems that have to be coped with are almost beyond the province of the automobile engineer. Take steel as an illustration of the point to be made; if the policy of any given maker of automobiles is such that the engineering department of the same company is compelled to use steel from a mill that is devoted to "quantity production," the probability of obtaining a good automobile out of quantity steel is in the ratio of 1 to 1,000,000. The fact remains that the engineer in charge will not be able to outshine his Board of Directors, so, that no matter how skillful the design may be, it will become

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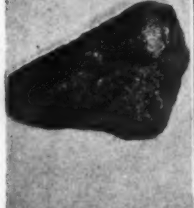

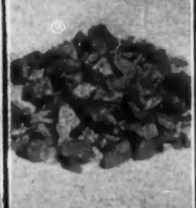

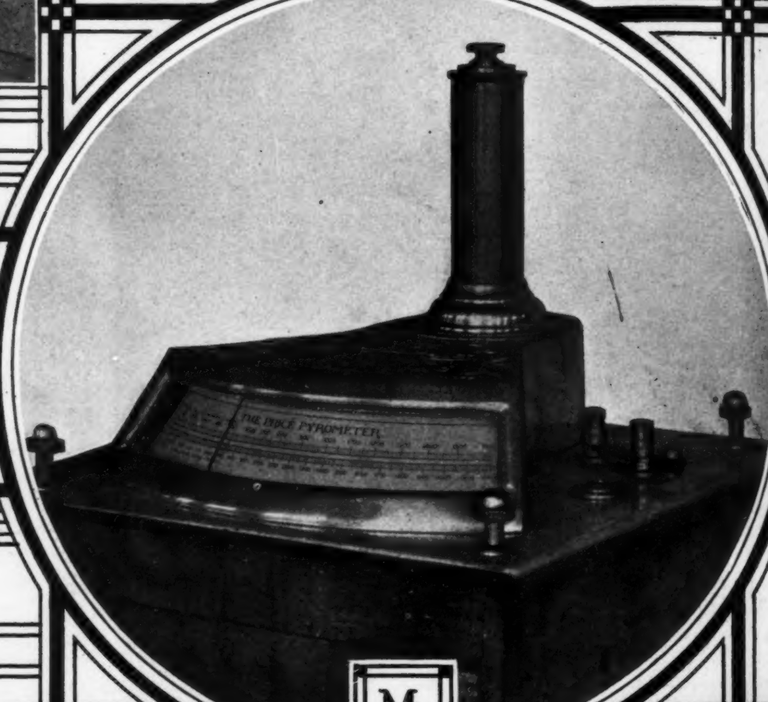

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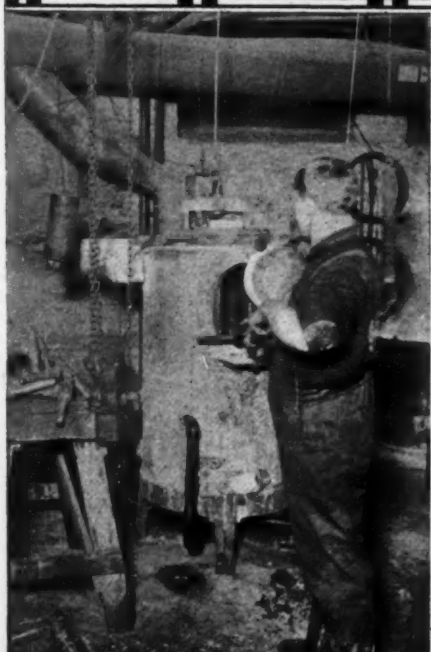

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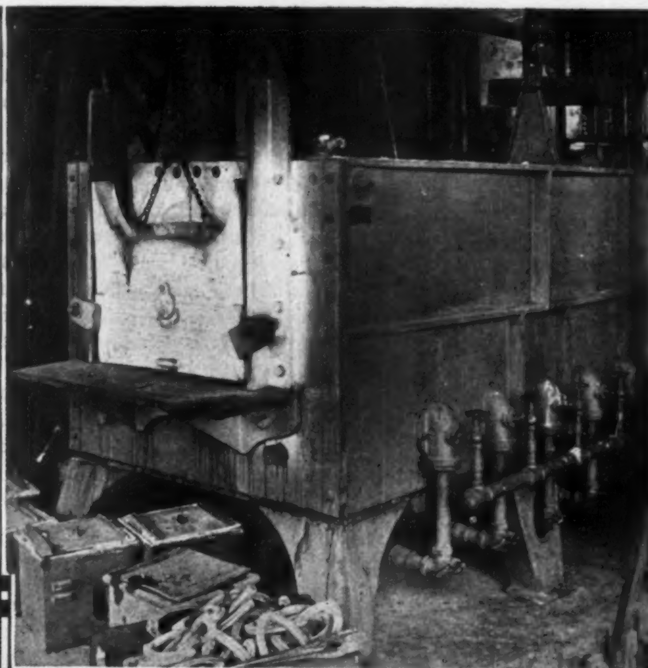
a monument to the stupidity of the concern that inflicts it upon an unsuspecting clientele.

The illustrations here afforded are offered as suggesting a line of thought, and referring to Fig. N of a commodious, well-lighted, and altogether comfortable designing establishment, the thought occurs that such a fine place devoted to the methods of giving concrete expression to the official thoughts of an official engineering corps could be of no lasting value in the face of commercial domination of the character that would compel the use of quantity-produced steel in the building of the product.

Every designer, when he starts out to fashion a part, must decide as to the strength and appropriateness of the material he proposes to use in order that he will be able to fix upon the percentage of the ultimate strength that is safe to preempt, taking into account the kinetic qualities of the material if the work is of a kinetic character, or the static ability of the steel if the load is quiescent. What a waste of time, then, to discover that the purchasing officer of the company is instructed by its Board of Directors to patronize a quantity mill.



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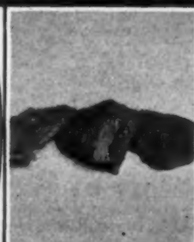

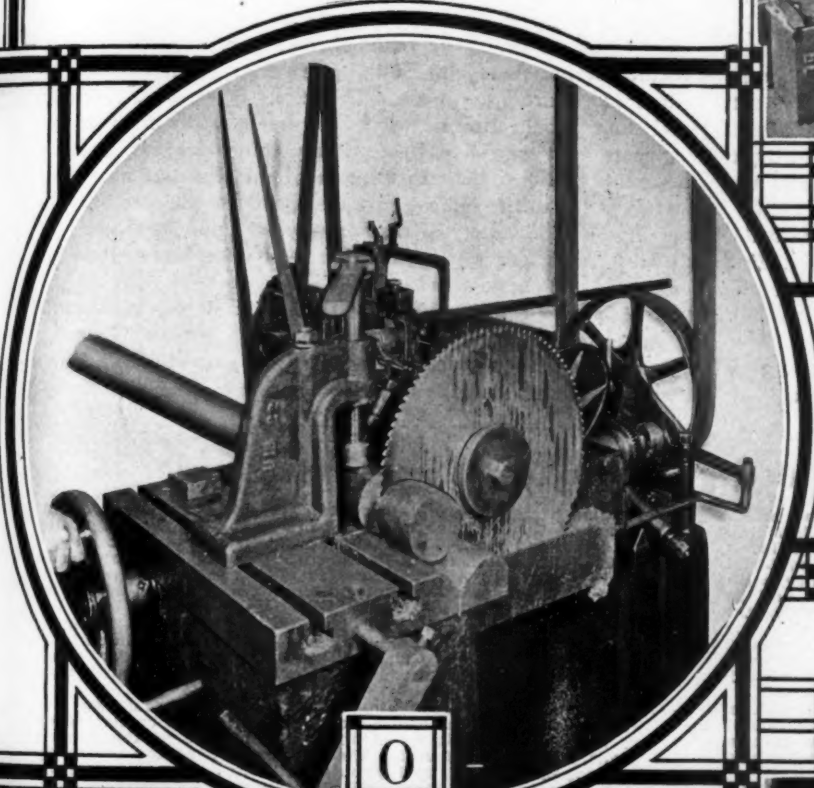

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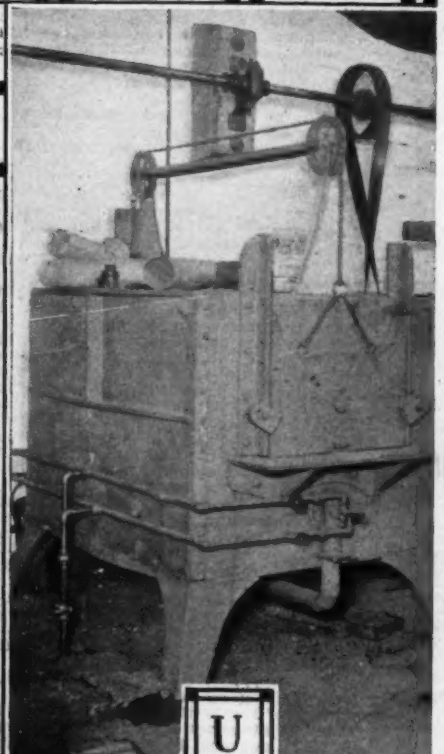

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Electric Refining of Steel Promises a Future

Of what possible avail will it be to claim that automobiles are up to the highest obtainable standard if the material used therein does not check up with the high claim? In the October issue of *Metallurgical and Chemical Engineering,* Joseph W. Richards reviewed the conditions as they obtain in Germany, taking cognizance of the refinements there made in the production of steel, utilizing electric furnaces, and he states on page 563: "A prominent American mechanical engineer, on returning from Germany, declared that the Germans were fifteen years ahead of the United States." The article deals with the electric production of steel at the Stahlwerke Rich. Lindenberg, Aktien Gesellschaft at Remscheid-Hasten; and in concluding Mr. Richards says: "Americans, wake up!"

In describing the qualities of electrically refined steel in THE AUTOMOBILE of September 15, it was pointed out that the quality of the fabric is better, considering a given grade of ores, that the metalloids are less deleterious in their action, and that the process is one that offers wide possibilities beyond the realization of the present time in so far as production is tied down to old and less efficacious methods.

Alloy steel has been developed to a high state in response to automobile requirements, and yet many automobile engineers have had but poor experience with the alloyed fabrics. It is not uncommon to find that an inferior grade of steel is rendered even less fit, due to the mingling of alloying elements, but those of the fabricators of steel who are mostly concerned about the size of their dividends take advantage of high-sounding phraseology, wasting good alloying elements in a poor field, and make up for lack of quality by loudness of talk long enough to inflict an impossible product onto the attention of an unfortunate engineer, making the same charge as if the very quality they talk about were present.

It seems to be the habit to charge a minimum of about 12 cents per pound for a fabric carrying chromium and nickel. An inferior grade of relatively high carbon steel that is doped with these elements is as easy to machine as a hunk of flint. Paying 12 cents per pound for this impossible material is a mere detail; it costs $12.00 per pound to machine it. On the other hand, there are grades of chrome-nickel steel that are marvelously strong, and their kinetic qualities are pronounced, notwithstanding which fact tooling is not difficult, considering, of course, the use of modern machinery equipment and the use of tungsten steel for the cutters.

In the same way, alloying with vanadium in conjunction with nickel or chromium, or both, or using vanadium alone, brings home to the ambitious designer the fullest compensation for his effort, if, perchance, the vanadium is used under proper conditions in a suitable grade of steel; but if the vanadium becomes a mere means for an advertising end, the steel is as unruly as a mad elephant in the hands of the machinists who do the work, and as irresponsible as a fire bug in the hands of the purchaser of the automobile.

From the point of view of the progressive engineer who is not swayed from his intelligent course by a blind Board of Directors, there is work to be done on the problems of standardization far beyond that as ordinarily outlined, and it is a question as to whether or not the agents of the fabricators of steel should be permitted to participate in the deliberations, it being the case that steel mills should furnish what is ordered rather than to tell engineers what they should use. Every effort, thus far, to bring about a condition of standardization of material has proven to be futile, due to the influence of the agents of the steel makers who give a wide variety of reasons why the mills should be permitted to work to a specification that has had its legs or its arms amputated and charge a price that is surely enough to pay for the fullest measure of extremities. What the automobile man wants is the best grade of steel that can be had in France, Germany, or Hongkong, at a price that should not exceed half of the 12-cent level that seems to be so fashionable in quotation circles.

Descriptive Captions of the Illustrations Accompanying This Article

A—Specimen of Lindenberg chrome nickel steel known as brand C N S-2 in the case-hardened state, enlarged to show the thickness of the shell, with the soft core Bendayed to bring out in relief the shell proper. The strength of this material in this state is 285,000 pounds per square inch tensility, with an elastic limit of 280,000 pounds per square inch, and at contraction of 8 per cent. in 2 inches on a ½-inch diameter test proof, with a reduction of area of 30 per cent. The chemical composition of this metal is 4.5 per cent. nickel, 2 per cent. chromium, and 0.10 carbon. The metalloids run, phosphorus 0.015, and sulphur 0.015, the manganese was 0.3, and the silicon 0.2.

B—Specimen of ferro-vanadium containing 25 per cent. vanadium. This material has a melting point of 3,055 degrees Fahrenheit and a specific weight of 5.5. Vanadium is used in certain types of automobile steel, sometimes with carbon alone, and in other cases with chromium.

C—Specimen of ferro-chromium containing 66 per cent. chromium, 2.3 per cent. carbon, and 31.7 per cent. iron. The melting point of chromium is 2,910 degrees Fahrenheit, and the specific weight is 6.8.

D—Specimen of ferro-molybdenum containing 88 per cent. molybdenum. The melting point of this element is 5,600 degrees Fahrenheit, and the specific weight is 10. Molybdenum is used with tungsten and chromium in the production of tool steel, but owing to its high melting point the success of its use has been retarded, excepting in the electric furnace. The presence of molybdenum in tool steel makes it possible to hold a cutting edge at a dark red heat.

E—Ferro-tungsten containing 85 per cent. tungsten, 1.3 per cent. carbon and 13.7 per cent. iron. Tungsten is used up to 25 per cent. in tool steel, and is employed up to 7 per cent. in magnet steel. It is finding a use in structural materials.

F—Specimen of ferro-manganese containing 80 per cent. manganese. This element has a melting point of 3,450 degrees Fahrenheit, and a specific weight of 7.2. It is used to a limited extent in carbon steel, is present in all forms of alloy steel, and takes rank as an alloying element in certain forms of spring steel, and chassis frame materials.

G—Specimen of ferro-silicon containing 50 per cent. silicon.

H—Special form of annealing oven used at the Maxwell plant arranged with a tier of drawers by means of which the work is stored in the oven and promptly removed therefrom at will, in which the front panel of the respective drawers serves as the air-tight cover.

I—Specimen of ferro-silicon containing 90 per cent. silicon. Melting point of silicon is 2,650 degrees Fahrenheit, and the specific weight is 2.5. Silicon is used up to 5 per cent. in steel for special purposes.

J—Specimen of ferro-titanium containing 25 per cent. of the latter. This metal is not known in the pure state; its melting point is 5,600 degrees Fahrenheit, and its specific weight is 4.2. This alloy is being used to some extent in conjunction with chromium and nickel in the production of alloy steel.

K—Specimen of ferro-chromium containing 80 per cent. chromium, 1 per cent. carbon and 12 per cent. iron. The melting point of chromium is 2,910 degrees Fahrenheit; the specific weight is 6.8. Chromium is used with carbon alone in tool steel and for ball bearing work; it is used with carbon and nickel in alloy steel for structural purposes and with vanadium as an alternative in structural work.

L—Example of barium chloride heat-treatment work, using a bath of this salt in the molten state at a pre-determined temperature for the purpose of correcting the structure of drop-forged front wheel knuckles and other important parts used in automobiles.

M—A simple form of milli-volt meter with the scale rearranged to read in both degrees Fahrenheit and Centigrade connected up to a pyrometer unit in an annealing furnace at the Elmore plant, by means of which the temperature of the annealing furnace is observed, and through suitable means of regulation it is maintained at any desired temperature consistent with the character of the work that is being done.

N—Taken at the Packard plant, showing a well-appointed drawing office with a surfeit of light, proper methods of heating, good ventilation, and such other facilities as will facilitate accuracy of engineering expression.

O—Type of cold saw used in cutting off steel in the production of gear blanks and other parts, presenting a real problem when alloy steel is used, owing to the short life of the saw blades and the slow rate of cutting.

P—In the hardening shop at the Packard plant, showing two rows of hardening furnaces with quenching baths between, and a system of ventilation by means of which the health of the operators is conserved, it being the case that some of the cementing materials, as potassium cyanide, are poisonous.

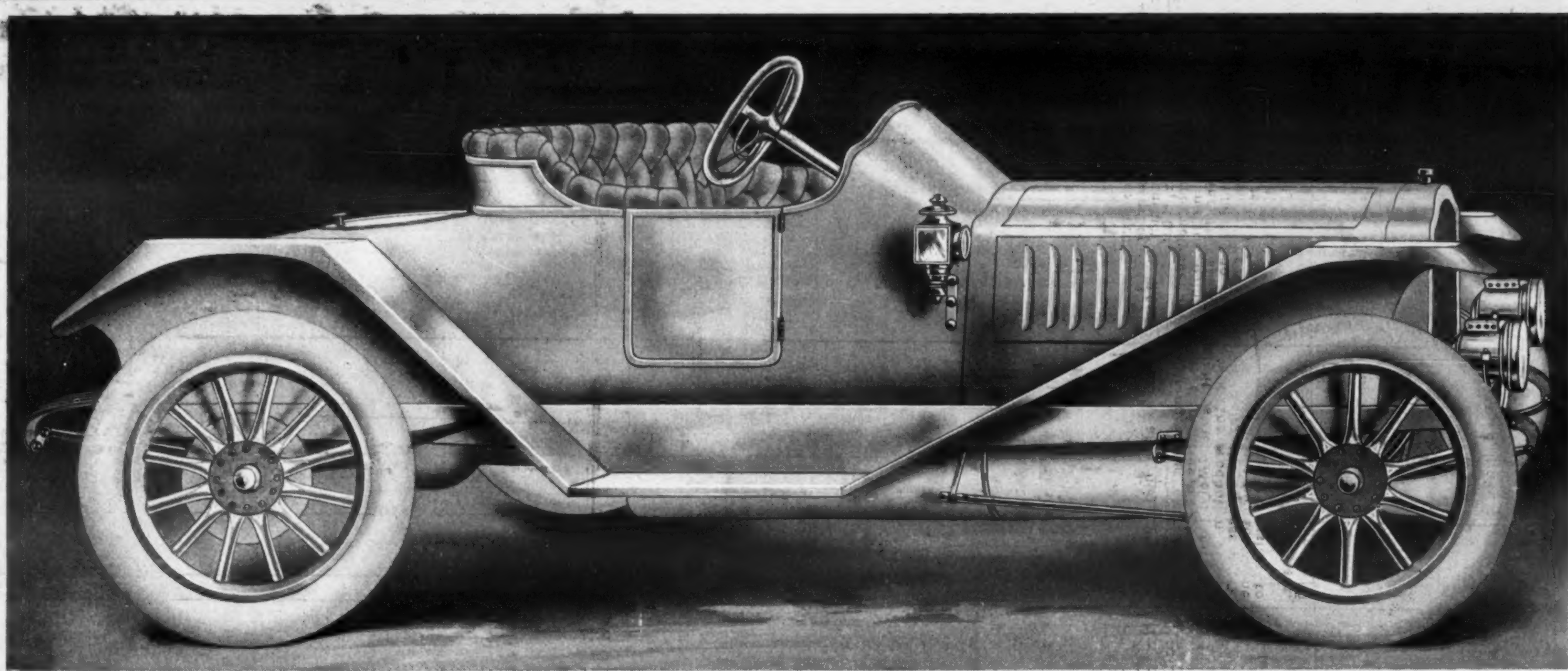
Q—A Frankfort annealing furnace which is self-contained, with precise means of regulating the temperatures—used at the Elmore plant.

R—Specimen of ferro-tungsten holding 85 per cent. tungsten, 0.75 per cent. carbon and 14.25 per cent. iron. The melting point of tungsten depends upon the parity, being 3,450 degrees Fahrenheit for high carbon ferro-tungsten up to 5,575 degrees Fahrenheit for chemically pure tungsten. The specific heat of tungsten is 17.5 to 19, and even higher for the tungsten wire used in incandescent lamps.

S—Specimen of nickel 99 per cent. pure, with a melting point of 2,690 degrees Fahrenheit, and a specific weight of 9.05. Nickel is the most used alloying element of all, serving in nickel steel, which is in common use, chrome nickel steel, and for other purposes as well.

T—Specimen of silico manganese holding 50 per cent. silicon and an equal amount of manganese. This compound is used in the production of spring and other equivalent grades of steel.

U—Simple form of heat-treatment furnace available for use with gas or oil as the source of heat and with a balanced sliding door and means for maintaining a constant temperature.



Among the Makers—Suggesting a Single-Seated Automobile for the Retired Gentleman

SUPPLANTING the horse is the problem that confronts the automobile; the task is half completed, but there still remain some 7,000,000 horse-drawn vehicles to be replaced, among which mention may be made of the little side-bar roadster, with its seat for one, drawn by a $10,000 horse with a pedigree as long as the arm of the exclusive fastidious gentleman who is done with the hurly-burly of the world, and prefers to enjoy life in his own self-contained way, taking great pride in his horse and trappings, with perhaps a well-bred dog to whom it is possible to look with safety for advice. It will be an undertaking to so design an automobile that it will be a fitting substitute for the graceful bit of equestrian animation which enters into the life of the man who is through with money only in so far as it will afford to him the means of living in his own way.

Of course the time will come when the almost entire absence of horse-drawn vehicles will have a marked bearing upon the equanimity of the man; there will be a mental struggle, and a few heart pangs, but the horse will have to go, making way for the nearest equivalent, which will probably be in the shape of a powerful, noiseless, elegant automobile. First cost will have no bearing upon the situation, nor will there be any requirements beyond those as mentioned, provided the car will accomplish precisely the work that is now being done by the horse-drawn equivalent. There is no reason why the coming of this type of automobile should be deferred; certainly the chassis may be had for the asking, and all that remains is to design a suitable body, and introduce this type of patron to the future source of the only enjoyment that he will consider worth while.

Cunningham Automobile

ANNOUNCING THE LATEST EFFORT OF A CARRIAGE COMPANY THAT MADE ITS DEBUT IN 1838, CHANGING OVER TO AUTOMOBILES IN 1911

THE early part of the year 1838 witnessed the modest beginning of a company that was destined to see the rise and fall of the carriage business, a company, in fact, that became a dominant factor, making the carriage business what it was and by its conservative and far-seeing policy produced the kind of carriages that were pleasure giving and profitable to its large clientele, but now that automobiles are rapidly eating into the progressive users' field, the policy of the company has been sufficiently modified to permit it to respond to the requirements of its customers, and in doing so place before its users a type of automobile that will appeal not only to the artistic side of the man who is accustomed to first-class carriage work, but to the mechanical keenness of the automobile expert as well.

The general appearance of the new car is brought out in Fig. 1, showing straight line design of body of the fore-door type, the same being of aluminum construction, seating seven passengers with ample room on a luxurious basis and a certain elegance of appearance and aspect that is accentuated to the utmost degree by the use of that character of upholstery that suggests permanence under severe conditions of service without becoming shabby.

In a mechanical way, James Cunnningham, Son & Company, of Rochester, N. Y., takes advantage of the latest and most approved methods in automobile designing, and the main features of the mechanical equipment are as set down in the table as here given; it being the case that the power plant and other mechanical features are identical in the five models, including touring car, close-couple roadster, limousine and landaulette. The price is the same for all the body options. The mechanical arrangement will best be appreciated by examining Fig. 4 of the stripped chassis, showing the radiator R1 on the center line of the front axle and the motor M1 as a self-contained unit, including the clutch C1 and the transmission gear G1, leading back to the live rear axle A1, through a propeller shaft S1, torsion being taken by the torsion member M2, and two universal joints U1 and U2 being used between the transmission gear and the live rear axle, notwithstanding the fact that the angularity of the power plant with respect to the live rear axle is reduced to a minimum under normal conditions of operation. The chassis frame has widened flanges at the point of narrowing N1, and is provided with three cross bars B1, B2 and B3 with integral flitch plates at points of fastening of the cross bars with the side bars.

The front spring suspension is half-elliptic, but the rear springs are three-quarter-elliptic, the idea being to take advantage of the fixed loading at the front, which is best handled by half-elliptic springs, and to afford soft riding in the tonneau by the use of properly contrived three-quarter-elliptic springs.

The power plant unit is shown in Fig. 2 of the right-hand side, with the motor case C1 in two halves, with the holding arms A1 and A2 integral with the upper half and the lower half C2 flanging on the center line, with an oil chamber in the bottom and an oil well W1 passing up and through the upper half to a filler through which the lubricating oil is spilled when it is desired to fill the oil well.

The flywheel is snugly encased in the housing H1, and the clutch C3 comes just at the point of flanging of the transmission gear case C4. The half-time gears are encased in the housing H2 and an extension E1 is provided with a bushed journal to support the cranking extension to which the starting crank C5 is attached. The magneto M1 is on a shelf S1 in a mid position and the centrifugal water pump W2 is in line with the magneto, both being driven by a suitably contrived shafting system that is driven by a pinion which meshes with

SPECIFICATIONS FOR CUNNINGHAM

MODELS	Price	H.P. A.L.A.M.	BODY		MOTOR				COOLING		IGNITION		Lubrication
			Type	Seats	Cyl.	Bore	Stroke	Cyl. Cast	Radiator	Pump	Magneto	Battery	
Cunningham....	$3500	36.1	Tour'g..	7	4	4¾	5¼	Pairs..	Tubular.	Cent'f'l..	Bosch...	Storage..	Splash.
Cunningham....	3500	36.1	Cl. Cp...	7	4	4¾	5¼	Pairs..	Tubular.	Cent'f'l..	Bosch...	Storage..	Splash..
Cunningham....	3500	36.1	R'ster...	7	4	4¾	5¼	Pairs..	Tubular.	Cent'f'l..	Bosch...	Storage..	Splash.
Cunningham....	3500	36.1	Limous.	7	4	4¾	5¼	Pairs..	Tubular.	Cent'f'l..	Bosch...	Storage..	Splash.
Cunningham....	3500	36.1	Land't..	7	4	4¾	5¼	Pairs..	Tubular.	Cent'f'l..	Bosch...	Storage..	Splash.

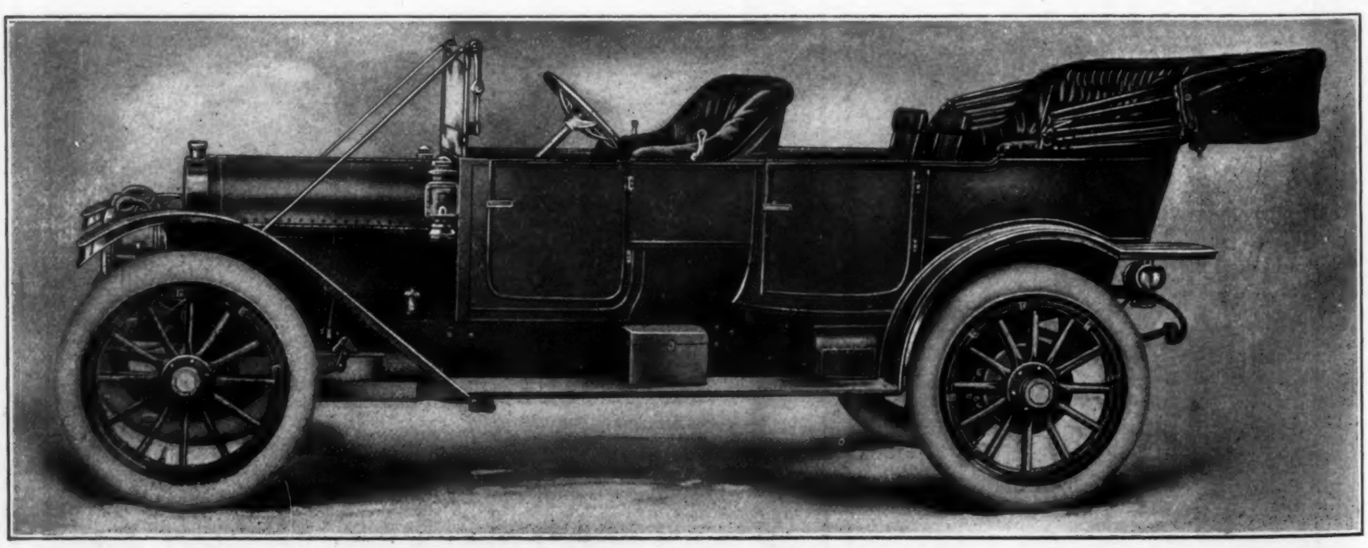


Fig. 1—Fore-Door Type of Cunningham Car with seven seats

the half-time train. The air propeller P1 is driven by a wide flat belt and the flanged driving pulley is on the same shaft driving the water pump and the magneto.

The cylinders C6 and C7 are cast in pairs, with an overhead-valve mechanism V1, V2, V3 and V4, with lifts passing up on the exterior of the cylinders from the camshaft, located on the right-hand side of the motor. The pedals P1 and P2 control the clutch and service brakes, respectively, but instead of fastening to cross bar at the chassis frame they are on a shaft which has its journals in the gearcase and are supported outside by two brackets, one of which is shown as B1. The linkage L1 is in an accessible position outside, with a means of adjustment whereby any wear that may creep in as a result of prolonged service may be compensated for. The extension of the power shaft through the back of the gearcase is flanged at F1, to which the universal joint is fastened and by means of which the torque of the motor is transmitted to the propeller shaft. The racks R1 and R2 are connected up with the side lever by means of which the gears are manipulated, utilizing a stout but much simplified linkage system with a liberal provision of bearing surfaces at every point and means for lubrication.

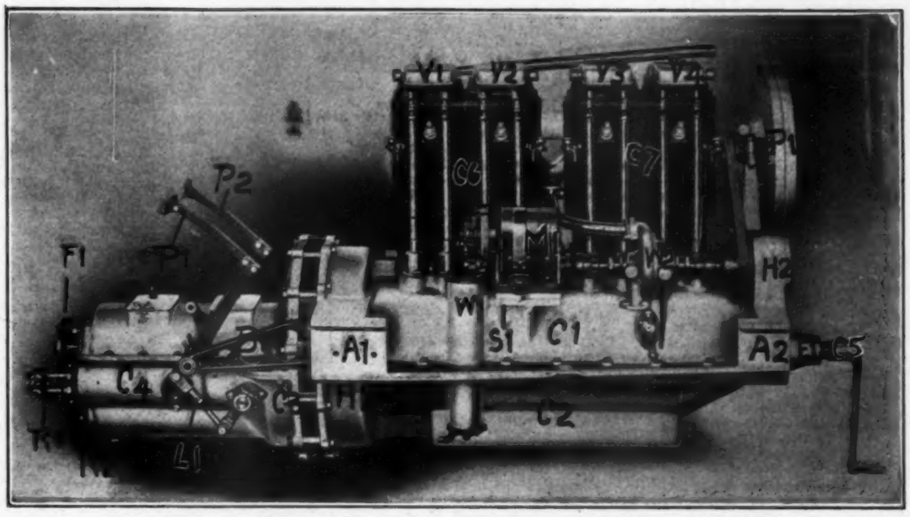


Fig. 2—Magneto side of the motor, also showing valves

CARS AS OFFERED FOR 1911

	TRANSMISSION							BEARINGS				TIRES	
Clutch	Type	Speeds	Location	Drive	Wheelbase	Tread	Frame	Crankshaft	Trans-mis'n	Axle	Weight	Front	Rear
Cone....	Selecti'e.	3	Motor..	Shaft...	124	56	P. Steel..	Plain...	Ball....	Roller...	3800	36x4½	36x4½
Cone....	Selecti'e.	3	Motor..	Shaft...	124	56	P. Steel..	Plain...	Ball....	Roller..	3800	36x4½	36x4½
Cone....	Selecti'e.	3	Motor..	Shaft...	124	56	P. Steel..	Plain...	Ball....	Roller...	3800	36x4½	36x4½
Cone....	Selecti'e.	3	Motor..	Shaft...	124	56	P. Steel..	Plain...	Ball....	Roller...	3800	36x4½	36x4½
Cone ...	Selecti'e.	3	Motor	Shaft .	124	56	P. Steel..	Plain...	Ball....	Roller...	3800	36x4½	36x4½

The simplicity of the working side of the motor as shown in Fig. 2 is carried out only in a more marked degree on the opposite side of the same as shown in Fig. 3, but for purposes of safety, the carbureter C1 is located in a mid position on the side opposite to the magneto, with a simplified intake pipe P1, leading up with two branches B1 and B2, through which the mixture passes to respective pairs of cylinders C2 and C3. The water connections W1 at the top and W2 at the bottom lead the water from the cylinders to the radiator and back again; they are of neat design and light construction, properly flanged with secure water-tight joints at finished flanging faces, suitably placed on the two pairs of cylinders. The exhaust manifold M1 is of large diameter, and its four branches lead in an upward direction to the point of flanging on the cylinders, so that the holding bolts are in a perfectly accessible position. There is one new and commendable feature to be observed in this manifold; it has lugs L1 and L2 which extend downward and afford a means by which the mixture manifold is held in place through the use of studs that pass through the lugs on the exhaust manifold and bear against cupped bosses in juxtaposition on the mixture manifold.

The importance of good lubrication is recognized in this power plant not only from the point of view of long life and the close limiting of internal losses, but with the understanding that noise must be conspicuous by its absence in any event. In order that the operator may know whether or not the supply of oil is adequate, a tell-tale T1 extends up from the lower half, permitting the operator to see at a glance just how much oil there is in the container and to observe the rate of reduction of the same during service. At points of vantage hand-holes are located and suitable covers are provided for each, with a ready means for their removal, so that the operator is permitted to inspect the mechanisms, clean off the working parts and maintain a profuse state of lubrication or the lower half of the crankcase, and the cover of the transmission gearcase may be removed.

The ignition system is of the Bosch dual type, utilizing one set of spark plugs, they being located on the left-hand side of the motor somewhat below the top, spacing between the lifts and delivering the spark at a point in the combustion chamber that has been found to deliver unusually good results. The gasoline tank holds 20 gallons, of which three are held in reserve for emergency purposes, the tank being so constructed as to bring about this result. The steering column is of the irreversible nut type with an adjustment take-up wear, and an 18-inch mahogany grip is fastened to an aluminum spider, so arranged with respect to the driver's seat that his position is natural, and his control of the movements of the car is rendered precise. Attention is called to the length of the wheelbase, which is 124 inches, and the pressed steel channel frame is designed utilizing a fine grade of material and a liberal

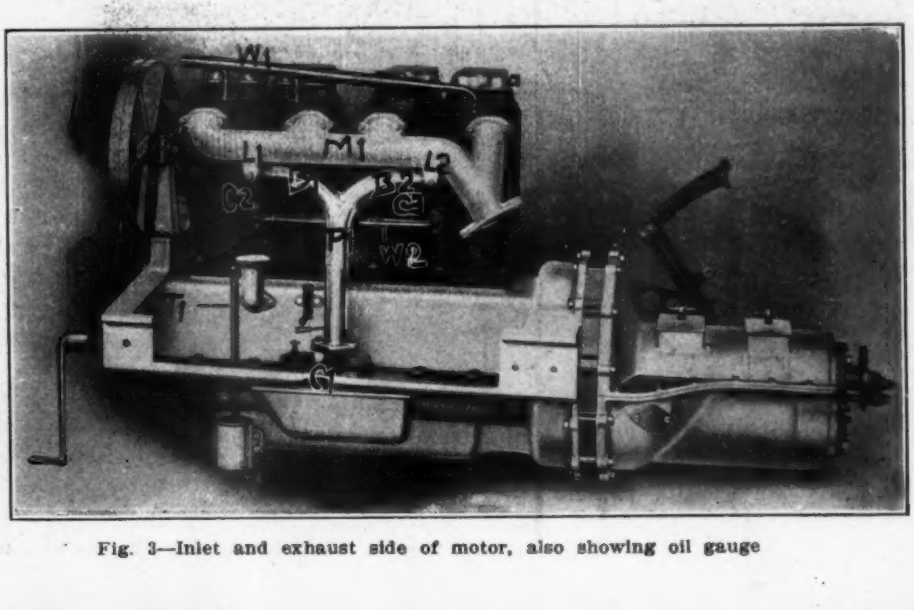


Fig. 3—Inlet and exhaust side of motor, also showing oil gauge

SPECIFICATIONS OF MATERIALS IN CUNNINGHAM CARS

Crankshaft—40 carbon steel, forged hydraulically under 100-ton press, heat treated and ground.
Connecting Rod—Special analysis high carbon auto steel, drop forged, I-beam section, heat treated.
Cylinders and Pistons—Finest grade of close-grained gray iron made in a foundry which produces nothing but gas-engine castings. Both are partially machined, then annealed to relieve internal strains and afterwards finished and ground.
Valves—3 1-2 per cent. nickel steel, heat treated and ground.
Valve Rocker Levers—Special auto steel, drop forged, heat treated and ground.
Crankshaft and Magneto Shaft Gears—Special auto steel, drop forged, teeth helical, heat treated.
Camshaft Gear—Cast iron, teeth helical.
Crankcase—Aluminum and copper alloy, of light weight and great strength.
Bearings—Parsons white brass, die cast under pressure, insuring a close grain and tough metal.
Piston Pin—Steel tubing, hardened and ground.
Camshaft—High carbon steel, heat treated and ground.
Clutch Facing—Oak tanned leather, with cork inserts.
Transmission Gears—Chrome nickel steel, drop forged and tempered.
Transmission Shafts—Chrome nickel steel, drop forged and tempered.
Transmission Bearings—Imported F. & S. annular ball bearings of very liberal proportions.
Auxiliary Gear and Fan Bearing—Imported F. & S. annular ball bearings.
Clutch Bearings—Timken roller bearings.
Wheel and All Rear Axle Bearings—Timken roller bearings.
Front Axle—3 1-2 per cent. nickel steel, drop forged, one piece, no weld, heat treated.
Rear Axle Housing—Pressed steel, autogenously welded horizontally.
Universal Joints—Spicer dust-proof.
Frame—High carbon pressed steel, heat treated.
Bearing Bushing—All small shaft bushings, such as camshaft, pumpshaft, oil pumpshaft, etc., are lined with Non-Gran bronze, which is conceded to be the best material for this purpose.
Cams—Drop forged, special case hardened steel, ground to shape and size. Case hardened face, soft collars, double pinned to shaft.
Cam Rollers—Case hardened and ground outside and inside.
Cam Roller Pins—Case hardened and ground.

GENERAL DIMENSIONS OF THE POWER PLANT

Bore	4 3-4"
Stroke	5 3-4"
Valve diameter	1 7-8"
Valve lift admission	5-16"
Valve lift exhaust	3-8"
Crankshaft diameter	2"
Front bearing length	3 1-2"
Center bearing length	4"
Rear bearing length	4 7-8"
Crank pin length	3 1-4"
Connecting rod length	12 9-16"
Camshaft diameter	1"
Timing gears, face 3 helical	1 1-8"
Cams—base dia. (harmonic motion)	2"
Cam roller diameter	1 1-2"
Cone clutch diameter	14 1-2"
Cone clutch face	3"
Flywheel diameter	17"
Main transmission shaft diameter	1 7-8"
Transmission jackshaft diameter	1.635"
Transmission gears, face	1" and 1 1-4"
Transmission gears, pitch	6-8 stub
Percentage of clearance space (compression space) to total cylinder volume	23%
Clutch spring	450 pounds

section with a view to safely spanning this wheelbase length.

While this question of the quality of material is up, attention is called to the use of chrome nickel steel I-section front axles, while the rear axle is of the full floating type, with a pressed steel shell and roller bearings throughout. The brakes are of the external contracting band type for service use and internal expanding type for emergency use, both located on the rear road wheels, taking advantage of large diameter pressed steel drums.

Practical Considerations in Body Finishing

The great question is to be practical; make the most of every point; be sure that the materials are pure and appropriate for the intended purpose—and be particular. A poor result always follows if the man who does the work has his heart in his boots.

For English purple lake use a ground of ivory black, for Catimuc lake a ground of English Indian red. Rose lake should have a ground of English Tuscan red.

For a quick development of English scarlet lake, at the present time popular with automobile folk, lay the lake over a ground of deep orange chrome. Orange mineral makes a good ground for the light lake. In the application and preparation of all lakes it is essential to understand that these pigments are, as a rule, rich in proportion to their depth. It is necessary, therefore, to avoid making the ground too light.

All the lakes, and all the grounds for the lakes, should be given ample time to perfectly harden before coating over them, otherwise they will lose in point of brilliancy and wearing capacity.

Furthermore, all grounds and preparatory surfaces should be brought out with a perfection of detail which admits of no surface defects. To repair a defect in the surface after the ground has been made ready for the lake is a very delicate, and in most cases unsuccessful, operation. If the lake is to be placed directly upon the old paint, the surface should first be touched up with some lead mixture, then puttied, and rubbed smooth.

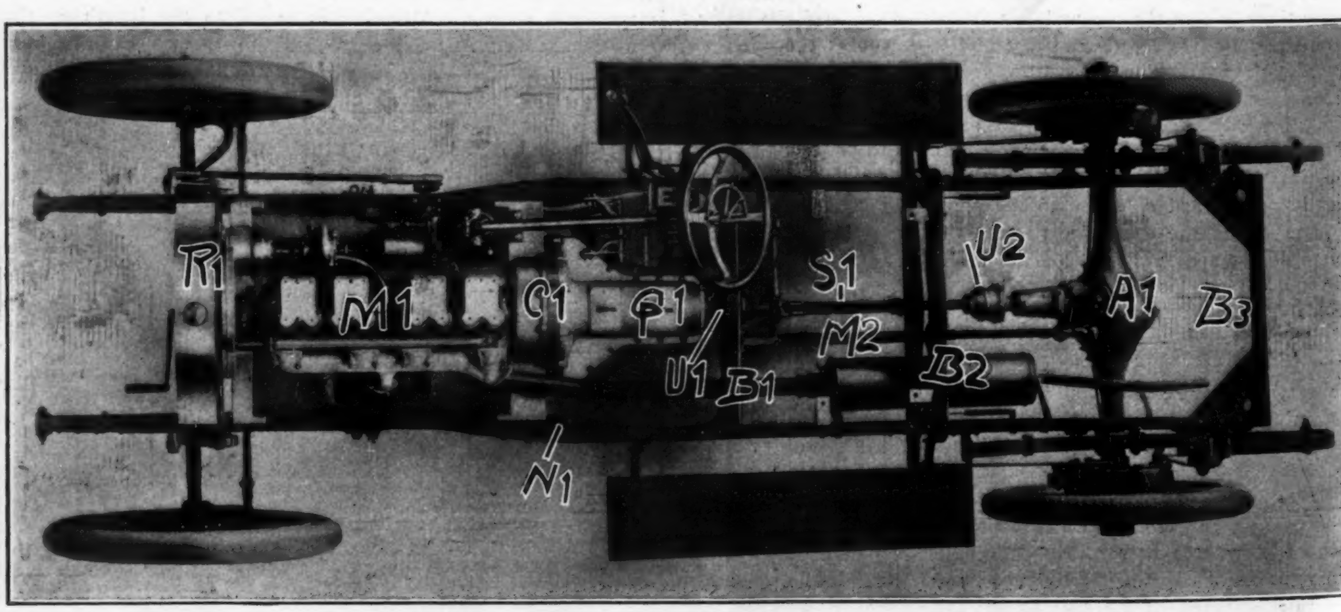
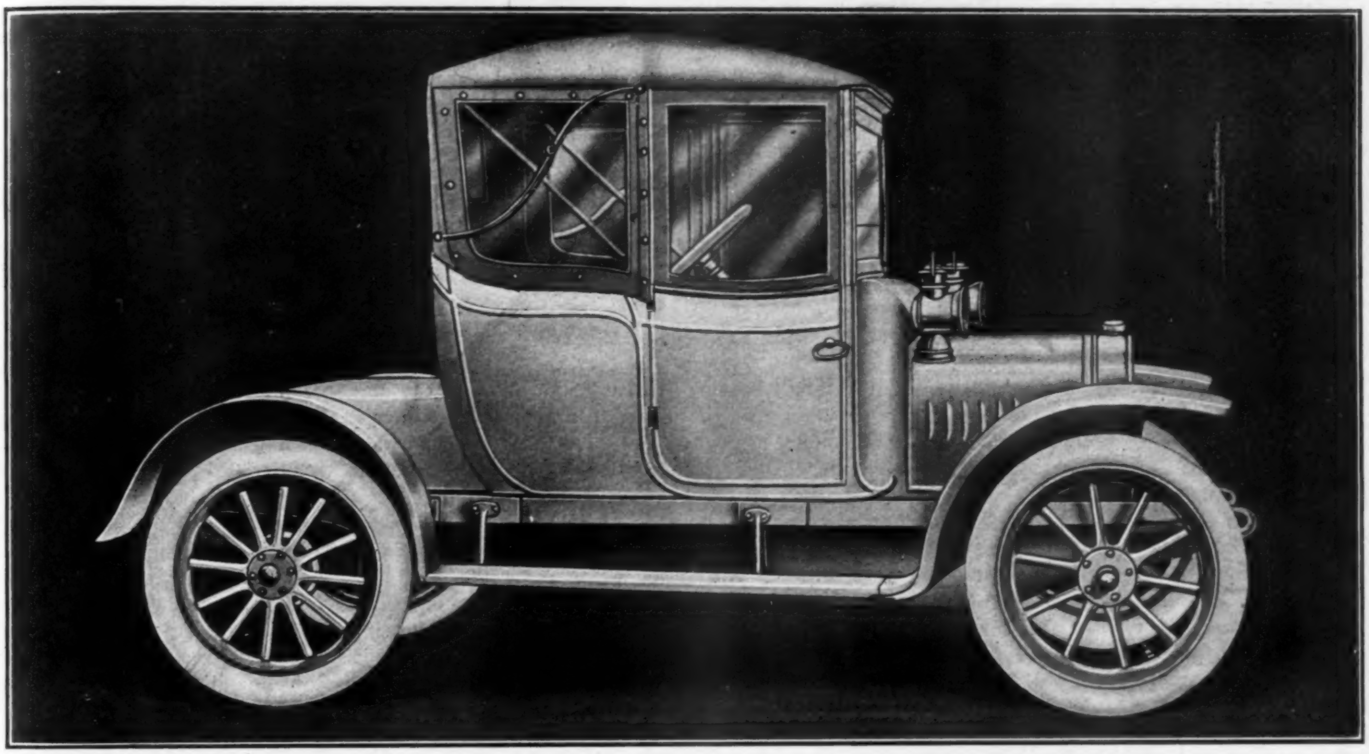


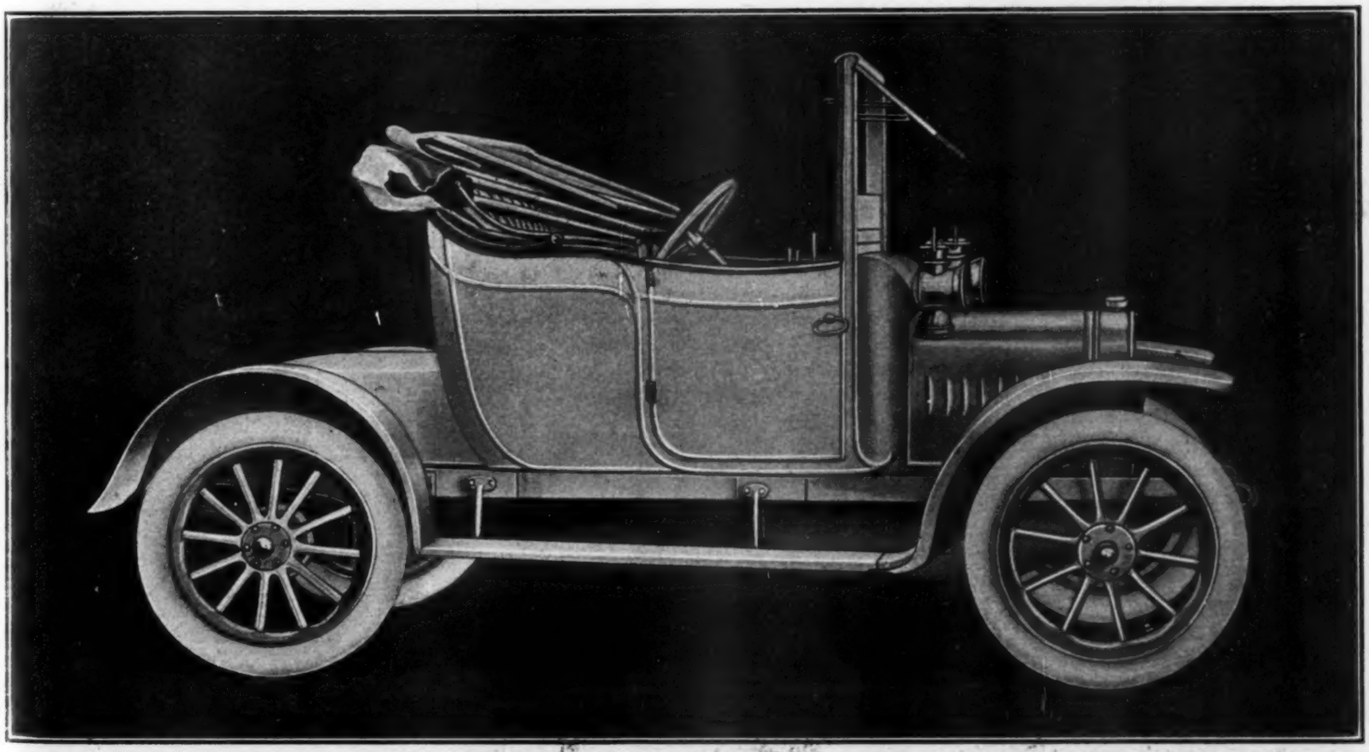
Fig. 4—Looking down on the Cunningham automobile with the body removed

Engineering Section

SUGGESTIONS FOR A DOCTOR'S CAR—NEW LIGHT-WEIGHT METAL—CARE AND REPAIR OF TIRES—BATTERY TROUBLES AND HOW TO REMEDY THEM—TIMING THE MOTOR, ETC.



SUGGESTION OF A BODY FOR DOCTOR'S SERVICE, SHOWING THE TOP AND CURTAINS UP



SHOWING THE DOCTOR'S RIG WITH THE TOP DOWN—THE FORE DOOR PROTECTS, BUT, BEING DESIGNED "DUTCH," MAY BE REMOVED

DOCTORS are sufficiently numerous and such good prospectives that some makers of automobiles get out special models of automobiles for them, but, considering their needs, it is believed that the subject will stand further consideration. The body work as shown on the title page of the "Engineering Section" of THE AUTOMOBILE this week, is offered as a good possibility. This body is so designed that it may be opened up for fine weather service, and when the conditions are inclement, it may be closed up. The control is "in-side." A body such as this, on a chassis that will stand continuous road work, should answer the purpose, but it is not recommended that a cheap makeshift will suffice for the intended work. Doctors must be taught to select good automobiles; they may know how to cure the sick and close the eyes of those who become wearied of the world, but when it comes to the selection of automobiles, it is believed that the skill of the doctor must give way to the practice of the mechanician.

There has been quite a little dissatisfaction in this field, and some doctors labor under the impression that automobiles are not quite up to the standard they recognize. This is due entirely to an attempt to make a small runabout accomplish the work of a full-fledged automobile.

New Light-Weight Metal

DURALUMIN IS THE NAME OF A NEW TYPE OF METAL THAT IS SAID TO HAVE THE STRENGTH OF STEEL AND THE LIGHTNESS OF ALUMINUM

DURALUMIN belongs in the aluminum alloy family, having over 90 per cent. aluminum in its composition, but the contents vary somewhat, there being two alloys known as Nos. 1 and 2, and the illustrations as here presented are of some of the forms of this metal. Fig. 1 shows sections, A being an odd-legged angle, B shows a T, and C is a channel section. The dimensions of these sections may be varied to suit the different requirements, it being the case that this alloy submits to rolling and has the strength and characteristics of rolled metal. As an indication of the ability of this material to stand the drawing process, it may be stated that it is used in the manufacture of cartridge shells. It will be remembered that this is one of the most difficult processes in the metal arts, and it takes an extremely good grade of material to accomplish this purpose. Duralumin may be had in the various thicknesses and widths to which sheet metal is rolled, and offers a fair measure of rigidity, coupled with an excellent showing of strength, together with lightness. Fig. 2 presents a round bar of this material, which is bent around until the two extremities contacted with each other without showing sign of distress at the point B. Fig. 3 depicts several diameters of rolled bars, and a series of strips of various widths and thicknesses, all of which are offered as a further indication of the fact that this metal lends itself to the several processes by which steel is rolled, flattened out, drawn, and otherwise manipulated for commercial purposes. In fact, there seems to be no limit to the classes of work that can be done with this material.

The inventor of this metal is A. Wilm, of Berlin, Germany, and he states that the general composition of the same approximates 90 per cent. aluminum, and the balance is mainly composed of copper and magnesia. It is pointed out that the weight of aluminum is in the preponderance, and that the 10 per cent. which represents the alloys is made up of metal that is heavier than aluminum, and for the rest by metal that is lighter than aluminum. The result is that the new metal has substantially the specific gravity of aluminum, varying a little above and below, depending upon the exact proportions of the alloys. The appearance of the new metal is substantially the same as that of aluminum, retaining the bright color, resisting oxidation, and other atmospheric influences.

Technically speaking, the new alloy shows a marked difference in its characteristics, depending upon the proportions of the admixtures, it being possible to vary the tensile strength all the way from 50,000 pounds per square inch minimum up to 85,000 pounds per square inch maximum, and it will appear that this is a very formidable strength, considering the fact that this metal weighs about one-third of the weight of steel, size for size. Since this metal is very much higher in price than steel, it of course follows that it is only available for special uses where a minimum of weight and an adequacy of strength are the ruling considerations. If weight is no criterion, since steel may be had in all degrees of strength, above and below the strength of this material, and at a very considerable reduction in the pound price, it follows that the steel would be given the preference. The fact remains, however, that there are a number of applications where light weight, accompanied by suitable strength, are the ruling factors and price is therefore almost a matter of no moment. It is for these classes of service that this metal is intended, and while it remains to be seen to what extent it will modify present practice in aeronautical endeavors, it nevertheless does prom-

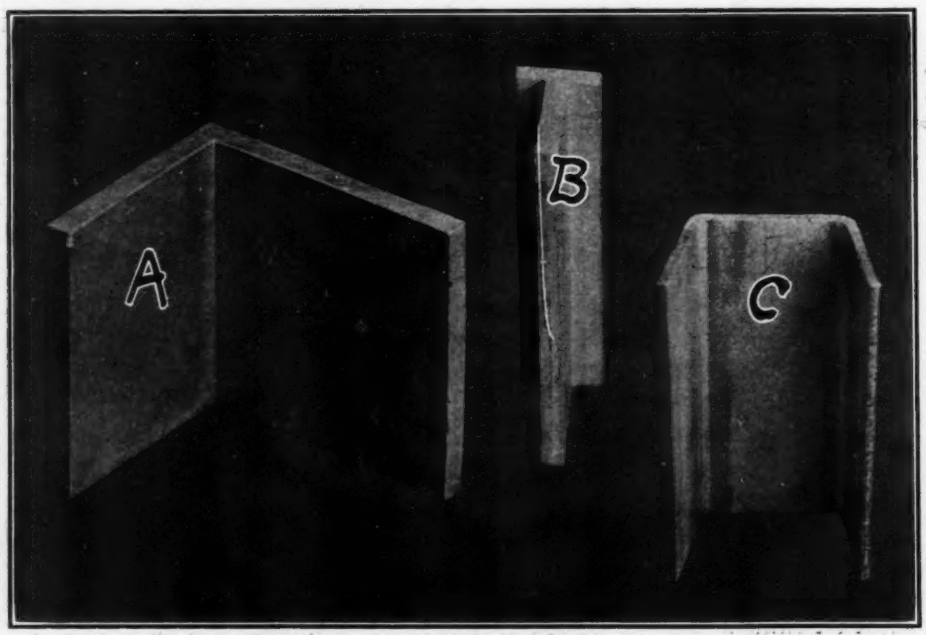


Fig. 1—A—Unequal-legged angle; B—T-section; C—Channel-section

ise more than a little, and it may be the ruling factor in this relatively new art.

It seems that this metal is being taken up abroad by the various military powers, and it is finding its way into many things where light weight and strength, coupled with endurance, take precedence over other considerations, as cost. The British government is reported as building a new large dirigible balloon, relying upon this metal for many of the important members in the structure thereof and among the well-known European firms that are producing Duralumin, Messrs. Vickers Sons & Maxim are mentioned. The specimens which were photographed for THE AUTOMOBILE were furnished by Marburg Brothers, the well-known engineers and importers, of 1777 Broadway, N. Y., and were exhibited by them at the Belmont Park Aviation Meet a few days ago for the first time in this country.

Fig. 2—Specimens of round bars and strips of this light, strong metal

The approximate characteristics of Duralumin are set down as follows:

Specific weight, 2.77 to 2.84;

Melting point, 650° Centigrade;

Color, bright and silvery;

Not affected by sea water;

Not affected by atmospheric conditions;

May be rolled, drawn and lends itself to various processes.

Alloy No. 1 has physical properties as follows:

Specific gravity, 2.77;

Tensile strength, 50,000 pounds per square inch;

Elastic limit, 26,000 pounds per square inch;

Elongation 21 per cent. (length not stated);

Reduction of area 34 per cent.

The alloy No. 2 has physical properties as follows:

Specific gravity, 2.84;

Tensile strength, 65,000 pounds per square inch:

Elastic limit, 36,000 pounds per square inch;

Elongation, per cent. (length not stated), 18;

Reduction of area, 26 per cent.

Rolling has a marked effect on the physical properties of the alloy No. 2 as follows:

Tensile strength, 85,000 pounds per square inch:

Elongation (length not stated), 3 per cent;

Reduction of area, 10 per cent.

Heat Value of Fuel Gases

Gasoline and other available liquids and gases as used in internal combustion motors are measured for heat value in British thermal units, or in calories. The liquids, whatever they may be, have to be changed into gases to be available, and it is always well to keep in mind the heating value of these gases, for then it is possible to estimate the magnitude of losses when an exhaust analysis is available. The following are the values of the several gases:

ACCEPTED THERMAL VALUES OF GASES USED IN FUEL

Name	Compound Formulae	Thermal Value B.t.u. per pound	Thermal Value Calories per kilo
Hydrogen	H	62,100	34,500
Carbonic oxide	CO	4,476	2,487
Methane	CH^4	23,851	13,245
Acetylene	C^2H^2	21,465	11,925
Ethylene	C^2H^4	21,440	11,900

The heating value of carbonic acid is nil; it follows that it is necessary to burn each of the gases to carbonic acid or water (H^2O) in order to obtain all the heating value that there is in them respectively. Every compound that is composed of carbon and hydrogen will burn to carbonic acid, accompanied by the production of some water. For complete combustion under conditions that obtain in the combustion chambers of motors it is necessary to dilute the mixture with an excess of air in order that there will be a sufficient presence of oxygen to serve the practical end. It is not practically possible to get along with the theoretical right amount of oxygen when the same is mixed with over 80 per cent. of nitrogen, as it is in air; the trouble is that the oxygen is more or less covered up.

The British thermal unit, on which these calculations are based, is that quantity of heat which is required to raise the temperature of one pound of water 1 deg. Fahr. at 39.1 deg. Fahr.

Fig. 3—Depicting several sizes of rolled bars of Duralumin and some of the regularly made strip products

1910 Edison Storage Battery

THIRD INSTALLMENT — DEALING WITH WALTER E. HOLLAND'S PAPER AS PRESENTED BEFORE THE TWENTY-SIXTH ANNUAL MEETING OF THE ASSOCIATION OF EDISON ILLUMINATING COMPANIES, HELD AT FRONTENAC, THOUSAND ISLANDS, N. Y., SEPTEMBER 6, 7 AND 8, 1910

THE output of an Edison cell is determined by the capacity of the positive or nickel electrode, as the individual electrode curves of the Figs. 5 and 6 show. The company has found it best in every way to design the cell with a sufficient allowance of iron active material to give considerable excess capacity to the negative electrode.

Cells do not have as high capacity when new as after some weeks of use. The betterment comes from an improvement of conditions in the nickel electrode which is brought about by regular charging and discharging. Overcharging expedites this self-formation and is recommended by the company. Every cell manufactured is given three overcharge runs before leaving the factory, and this is always sufficient to bring the capacity up at least to the rating. The accretion of capacity continues for twenty, or more, runs, and no results can be considered typical which are obtained in tests made earlier than the twentieth run. The term "run" is used to mean a full charge and complete discharge.

The output and efficiency of a cell, working at ordinary temperature, depend upon three factors—the rate of charge, the

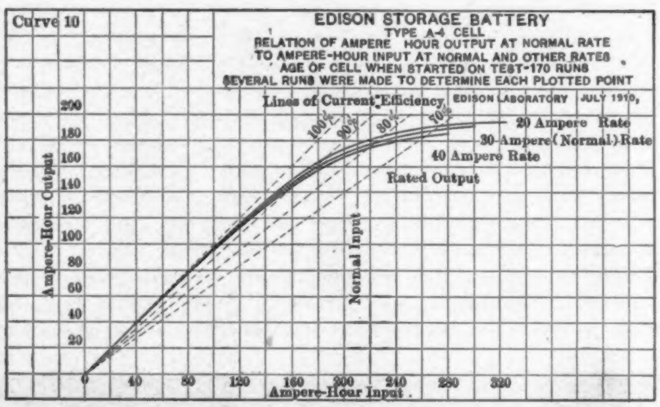


Fig. 10—Relation of ampere-hour output at normal rate to ampere-hour input at the same rate

amount of charge, and the rate of discharge. Figure 10 shows the relation of current output to current input when a cell is given different lengths of charge at 2-3, 1, and 1 1-3 times normal rate. It will be seen that for low inputs the efficiency is very high and practically the same for the different rates of charge. Further along the curves separate, the advantage being in favor of low-rate charging. Notice that the point taken as the normal input (210 ampere-hours for A4) comes pretty close to the sharpest part of the bend. Fig. 11 gives the characteristic curves with output and efficiency data for this normal input point.

The relations of current and energy output and of current and energy efficiency to the length of charge at normal rate are summarized in the curves of Figure 12. These curves show maximum efficiencies on short charge of practically 99 per cent. in ampere-hours and 75 per cent. in watt-hours, while on normal 7-hour charge the efficiencies are respectively 82 per cent. and 58 per cent. It is often found advantageous (and economical, too) to work the battery at the lower efficiencies of a 9 or 10-hour charge, thus realizing exceedingly high output results.

Watt-hour efficiency is the product of ampere-hour efficiency and "volt efficiency"—the latter term being used synonymously with the term "coefficient of drop" to express the relation of the average voltage of discharge to the average voltage of charge. The volt efficiency depends principally on the rates of charge

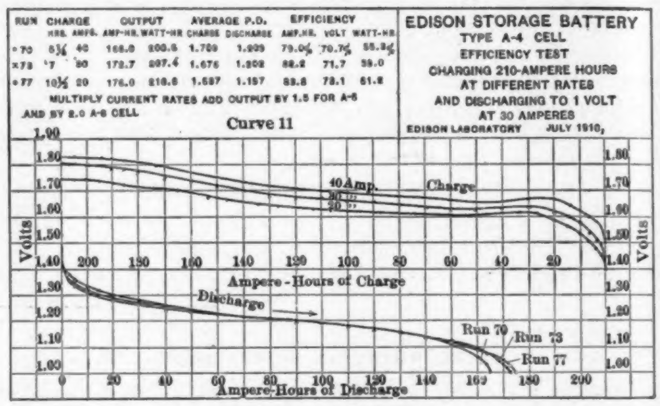


Fig. 11—Efficiency tests plotted to show results at different rates of discharge

and discharge and does not vary much under ordinary conditions. Charging and discharging at normal rate, its value will be close to 72 per cent. for any length of charge not extremely short or long; and this figure therefore represents the practical limit of watt-hour efficiency for normal-rate working. The watt-hour efficiency on any normal-rate test may be calculated accurately enough for all practical purposes by taking 72 per cent. of the easily determined ampere-hour efficiency. Decreasing the current rate increases the volt efficiency, thus raising the limit of possible watt-hour efficiency.

The Edison cell has an air-tight cover, a valve being provided for the escape of gas. Practically no water is lost by evaporation, therefore, and the battery can be left idle for months with-

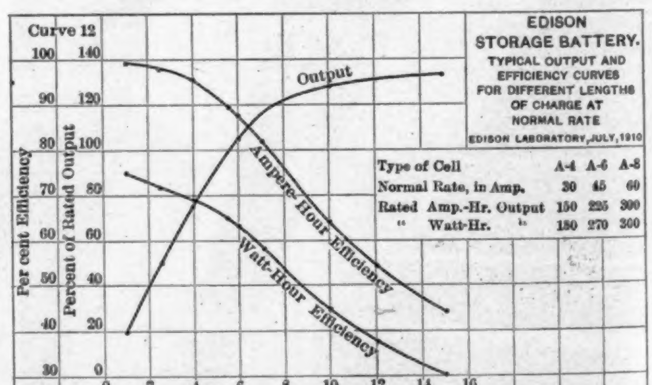


Fig. 12—Efficiency tests plotted at different lengths of charge at normal rate

out attention and there will be no danger of the solution getting low. Water is lost when a battery is working, however, and this results entirely from overcharging; for any current which is not used to effect the chemical changes at the electrodes goes

to produce hydrogen and oxygen, the elements of water, which are emitted as gas. To replace this loss, pure water must from time to time be added. The figure of ampere-hour efficiency represents the proportion of a charge which goes to produce the desired chemical changes at the electrodes; therefore the balance is proportional to the loss of water. Thus from the curve, Fig. 12, we see that charging 7 hours at normal rate (210 ampere-hours input) the ampere-hour efficiency is 82 per cent. and charging 10 hours (300 ampere-hours input) it is 64 per cent. The loss of water therefore would be represented by 18 per cent. of 210 = 38 ampere-hours in the first case and by 36 per cent. of 300 = 108 ampere-hours in the second case—showing that a battery which is worked continually on 10-hour charges would require the addition of water about 3 times as often as one worked continually on 7-hour charges. This points to the possibility of reducing the amount of required filling to almost nothing in those cases

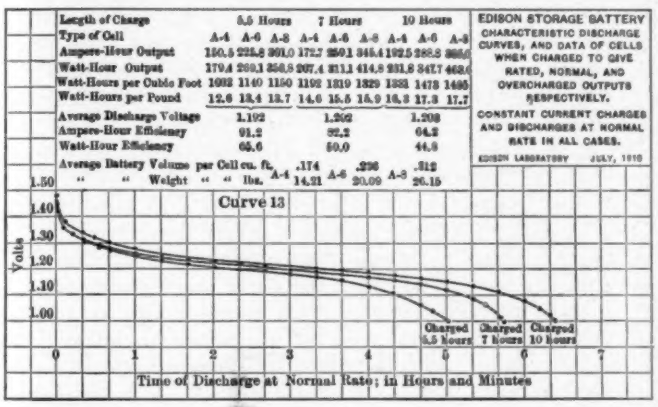


Fig. 13—Characteristic discharge curve of cells when charged to a given rate.

where a battery can be worked on short frequent charges at high efficiency.

Fig. 13 shows characteristic discharge curves and data for a cell at its rated output, at its normal output and at its overcharge output. Note that only 5 1-2 hours' charge at normal rate is required to obtain the rated output, and the efficiency under these conditions is very high; while under the overcharge conditions exceedingly high output per unit-weight of battery is realized at a sacrifice of efficiency.

Although in most of the tests presented here the cells were charged at constant current, this was done only for the sake of convenience; and in practice it is really better to "taper" the rate in the familiar manner of charging lead batteries. This is

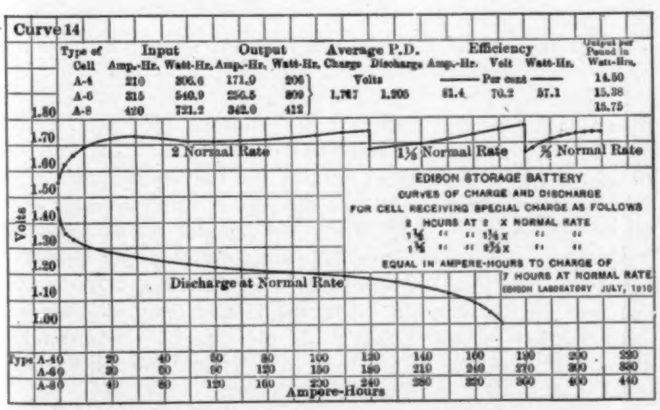


Fig. 14—Curve of charge and discharge for cells receiving special charges

of especial advantage where the time on hand for charging is limited.

Fig. 14 shows the result when the normal imput of a 7-hour charge is put in in 5 hours, by using higher rates early in the charge. The results are practically as good as in the case of the 7-hour charge. (See Fig. 11.)

Constant current discharges of the Edison battery at no matter what rate are found to give a quite constant output figure if carried to very low voltage (see Fig. 15), and differ only as to average voltage, this being higher or lower according as the I R drop in the cell (depending on the I valve) is little or much. The low voltage part of the curve cannot be considered useful, however; so the statement sometimes made that the ampere-hour output of the Edison battery is independent of the discharge rate is not strictly true. On the other hand, it would not be a fair test to terminate high-rate discharges at 1.0 volt or 0.9 volt, as is done usually in normal-rate tests, because this would not correspond to the same state of discharge; and the cell would start the next charge in a semi-charged condition, which would make the subsequent discharge abnormal. Also, it is possible to discharge at a rate so high that the very first volt reading will be lower in value than the above-mentioned regular terminating voltages. The author believes the fairest plan in this case is to discharge to successively lower voltage points as the rate is increased, each terminating voltage to be lower than the previous one by a valve corresponding to the average increase of I R drop in the cell resulting from the increase of current. Thus, if the "A-4" cell (whose average internal resistance, Fig. 9, shows to be .0037 ohm), is usually taken to 0.9 volt on a discharge at 30 amperes, the discharge should be carried 0.11 volt lower or to 0.79 volt when the rate is doubled to 60 amperes, because in that case the average increase of I R drop in the cell would be $30 \times .0037 = 0.11$ volt. If this plan be followed the amount of change of voltage from the beginning to the end of discharge will be practically equal at all rates, and the cell will be taken to a corresponding state of discharge each time.

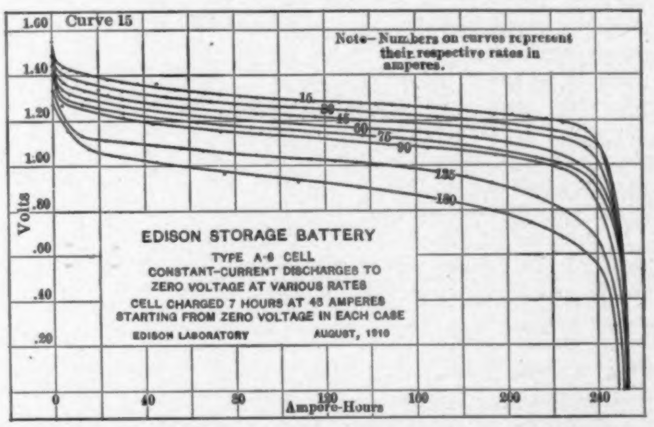


Fig. 15—Constant current discharge to zero voltage at various rates of discharge

Timely Tips for the Tyro. Remember—

That first and foremost comes the selection of the chassis. The easiest way to do this is for the purchaser to make up his mind what type of body he intends to have. The two parts are separate, and it is only a matter of a few bolts that fix the body to the frame that require changing. The next point is the topographical nature of the country that the car is mostly to be used in; for instance, it would be useless to have a heavy limousine on a light, low-powered chassis for hilly and indifferent roads, and equally unnecessary to have a 60-horsepower runabout for town work.

The length of one's pocket often determines the amount one is prepared to pay for the car, but where this is not a matter of moment a limitation of a few hundred dollars should not influence the choice. Experience of owners of cars is the best criterion, and if the buyer can come in touch with several of these direct he should be in a position to form an opinion that will enable him to secure the car that is in every way best fitted to the service for which it is intended.

Cantor Lectures on Motors

PROFESSOR W. WATSON, D.SC., F.R.S., DELIVERED A SERIES OF LECTURES ON THE GASOLINE MOTOR, OF WHICH THIS IS THE SECOND INSTALLMENT—BY PERMISSION OF THE ROYAL SOCIETY OF ARTS

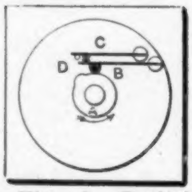


Fig. 6 — Typical make - and - break system of contacts

PROFESSOR SPRINGER finds that the energy stored in a low-tension coil, such as is used for petrol engines with a maximum current of 1.3 amperes, is about 14 foot-pounds, *i. e.*, equal to the work done when 1 pound is lifted through 1.7 inches.

In order to illustrate the other system of ignition, namely, the high-tension system, I will make use of the same coil, but now only one set of windings will be connected to the battery, while the other set will be connected to the lamp. On making the battery circuit so as to cause a current to start in the coil, a current will be produced in the other set of windings, and the lamp will glow for an instant. On breaking the circuit containing the battery the lamp will again glow, but more brightly, indicating that an induced current is produced. If I break the current slowly, so that a visible spark is produced at the break, the lamp in the secondary hardly glows at all, showing that it is an advantage to get a rapid break of the current in the primary circuit. The reason why when one switch is opened slowly the current is only slowly reduced, is that even after the switch begins to open the current continues to flow, this flow being made evident by the spark. If, however, we connect a condenser to the two sides of the switch, when the switch begins to open, the condenser will commence to charge, and will thus, in a sense, absorb the current so that no spark is produced, and the decrease in the current in the coil will be very much more rapid, and hence the lamp in the secondary circuit will glow very brightly. The absence of the spark (at the point where the current is broken) produced by the condenser is also an advantage, in that the contacts will not be burned away in the way they are if a spark is produced.

In the case of the ignition of the charge in the engine, the break of the primary circuit may either be made by a cam, A, Fig. 6, which rotates at half the speed of the crankshaft or by a trembler.

In one form of make and break, as the cam rotates (Fig. 6) the spring D is lifted so that a platinum contact stud on the upper surface comes in contact with a stud on the lower surface of the spring C, thus completing the primary or battery circuit. When the cam rotates somewhat further the springs B and C both commence to descend and thus acquire a certain speed before the spring C strikes the pin D, when the circuit is broken. In this way a quick break is secured without the necessity for making the sides of the cam very steep, so that the wear of cam, and contact which it raises, is reduced to a minimum, thus insuring a maximum of efficiency.

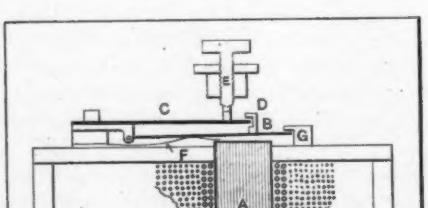


Fig. 7—Typical form of trembler mechanism

A diagrammatic section of a trembler contact breaker is illustrated very clearly in Fig. 7. The core of the coil A consists of a number of fine iron wires surrounded by a primary coil of thick wire of a comparatively few number of turns and a secondary coil consisting of a very large number of turns of fine wire. One end of the secondary coil is connected to the sparking plug and the other to the engine or frame of the car. The battery circuit is taken through some form of contact maker, usually called a commutator, to the screw E and thence through the spring to the other terminal of the battery. When the circuit is completed by the contact maker, which is rotated at half the crankshaft speed, the current passing through the primary of the coil magnetizes the core so that the soft iron plate B is attracted. This plate is normally kept up by a spring, F, but after it has moved a little way down and thus acquired some velocity the catch D strikes against the spring C and, pulling this latter down, breaks contact with E, so that the primary current is broken and a spark passes, due to the induced current in the secondary. The breaking of the primary circuit causes the core A to lose its magnetism so that it no longer attracts B, which being forced up by the spring F, allows the spring C again to touch E and thus completes the primary circuit, when the whole process is repeated.

The mean current consumed by a trembler coil as supplied with a motor car when the trembler is continuously buzzing may be anything up to 3 amperes, but a well-designed coil will work quite satisfactorily with .5 ampere or even less. A coil having a low-current consumption is a great advantage, since the batteries last so much longer, and the contact on the trembler does not burn away.

It will be noted that with the make and break first described we only get a single spark to fire the charge, while with the trembler we may get a succession of sparks, since the trembler continues to break and make the circuit as long as the contact is completed at the commutator. At slow speeds there is no doubt that we may in this way get a succession of sparks; at high engine speeds it is, however, very doubtful whether any trembler has more than time to give a single spark. I have in a great many instances carefully measured the speeds of the tremblers of a number of coils and find that a good trembler when well adjusted gives between 150 and 250 breaks per second. Taking as a mean 200 per second, the interval between successive sparks is .005 second. If the sector which makes contact on the commutator is 20 degrees, which corresponds to a rotation of the crankshaft of 40 degrees, the circuit is completed at the commutator for .0056 second when the engine is turning at 1,200 revolutions per minute. It is thus evident that for speeds greater than this there is only time for the trembler to break the circuit once and hence a single spark is produced just as in the case of a non-trembler coil. That this is a fact will be seen from some photographs which I shall show in a subsequent lecture. (Fig. 16.)

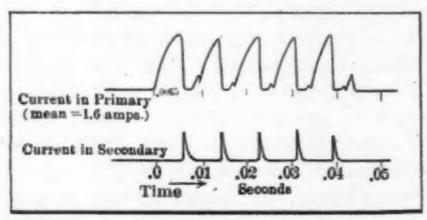


Fig. 8—Oscillographic record of current consumption

In Fig. 8 are shown the oscillograph records of the currents in the primary and secondary of a trembler coil, obtained by Professor Springer. The very rapid fall in the current in the primary when the trembler breaks the circuit and the correspondingly rapid rise in the current in the secondary when the spark passes in the spark gap will be noted. The spark gap was taken as a quarter of an inch, as it was in air, and

would thus correspond to about the ordinary gap used in a spark plug when acting in the compressed gases in the engine.

There is one other system of coil ignition which has several points of interest about it. I refer to the Lodge system. The arrangement used in this system is indicated diagrammatically in Fig. 9. The terminals of the secondary of the coil, which is an ordinary high-tension coil, are connected to the inside coatings of two Leyden jars C and D. There are two spark gaps, one A between the inside coatings of the jars and the other B connected to the outside coatings, this latter is the gap in the spark plug inside the engine. When the trembler of the coil breaks the primary circuit the E.M.F. induced in the secondary causes the two jars to charge up, one with a positive charge inside and the other with a negative charge inside. At the same time the outside coatings become charged, one negative and the other positive. The charging of the jar continues till the rise in the potential of the ends of the secondary is sufficiently great to cause a spark to pass across the gap A. Now, when a spark has once passed through the air between the knobs forming the gap A this air becomes quite a good conductor of electricity and hence the two jars discharge through this conducting air, this discharge occurring extraordinarily quickly. The inside coatings having lost their charge, the outside coatings have their charges released and discharge across the spark gap B. Now, the peculiarity of the spark at B is that the release of the charges on the outside coatings is so rapid that the electricity will jump straight across from one point to the other of the spark gap B rather than go *round* even a low-resistance alternative path so long as it is longer and encloses a space so that a magnetic field would be set up if a current passed through the conductor. I can at once show this effect, for I will short-circuit the spark gap B by a piece of thick copper wire bent into a circle of about 8 inches diameter, when you notice that rather than go round this very low-resistance *détour*, the spark jumps the very high-resistance gap. This is the reason why, in the Lodge system, faulty insulation is less likely to put the plug out of action than in the ordinary system. Of course, if I short-circuit the spark gap A with the copper hoop, which corresponds to short-circuiting the sparking plug in the ordinary system, no spark occurs across the gap. The reason is that the discharge in the secondary of the coil is not sufficiently rapid, so that the current prefers to go round by the low-resistance path. If the spark gap B is short-circuited by a straight wire no spark will occur; the path along the wire being no longer than that along the gap, the discharge goes by the path of low resistance.

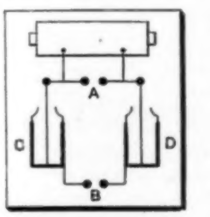


Fig. 9—Lodge system of coil ignition shown by diagram

Having described at some length the principle on which coil and battery ignition systems work, I need only very briefly refer to magneto ignition. In the coil and battery system the current is derived from the battery; the magneto is simply an arrangement for replacing the battery by the E.M.F. induced in a coil of wire which is moved in a magnetic field. To show this effect I have a rough galvanometer on the table and a length of insulated wire connecting the terminals. If I take this wire and pass it between the poles of a magnet a small current is produced and a very slight momentary deflection of the galvanometer occurs. By suitably turning the passages of the wire I can get up a more noticeable swing. If I take two or three turns of the wire and slip them over one pole of the magnet I get a more noticeable deflection, while by taking a coil of about twenty turns the galvanometer is violently deflected.

A magneto for low-tension ignition consists essentially of a coil of wire wound on a soft iron spindle forming what is called the armature, which is rotated between the poles of a strong permanent magnet. The ends of the coil are connected to the make and break within the cylinder, just as in the case of the battery and coil, but here the coil acts as its own battery, owing to its motion in the magnetic field. When a high-tension system is used either a low-tension magneto may be employed to send the current through the primary of an ordinary trembler coil or the armature may contain both the primary and secondary windings so that no separate coil is required. The action in such a case is as follows: As the armature rotates a current is induced in the primary windings, the ends of which are short-circuited through a make and break. The direction in which the current induced in the primary of the armature circulates is such that it tends to keep the magnetic state of the iron core of the armature the same as it was when it stretched straight across between the poles of the magnet. When the core of the armature has got to a position about at right angles to the line joining the poles the current in the primary is suddenly interrupted by the make and break, which is opened by a cam rotated at half the crankshaft speed. As a result, the iron core suddenly loses its magnetism, for in the position it now occupies the magnet no longer tends to keep it magnetized and hence, just as in an ordinary coil, an induced E.M.F. is produced in the secondary, which causes a spark to pass at the sparking-plug points.

The performance of an engine is often tested by determining the amount of work it can do in a given time under certain given circumstances—as to speed, etc. Thus the engine may be put in a chassis, and the speed on the level and up certain hills may be noted and compared with the results given by similar engines, or those obtained with the same engine when some previous arrangement of valve setting or the like existed. The objection to this method lies in the fact that owing to variations in the road conditions, wind, and such like, the circumstances attending different trials on the road are never quite the same, and hence it is difficult to be certain that any change in the speed of the car obtained is not really due to such differences rather than to the alteration in the engine which is being tested.

If, in place of testing the engine in a car it is run on a test bed, much more reliable data can be obtained. There still remains the objection, however, that the brake horsepower thus determined depends on a large number of variables, such as the carburation spark advance, setting and size of valves, length of induction pipe, and the like, so that really to study the engine a very large number of separate tests have to be made in which each of these factors is varied, one at a time. Thus, to take the case of the timing of the valves, observations would have to be made at many different speeds, using different valve timing, which would involve making a number of different cam shafts. If, however, we were able to follow what goes on in the cylinder, noting the pressure on the induction, compression, firing and exhaust strokes, we could at once infer what would be the result of making, say, the exhaust valve open later, so that in place of making wild shots, more or less in the dark, we could alter the cam in the direction to get a better result. We thus see that any instrument which will enable us to determine the pressure in the cylinder at any point of the stroke will be of much assistance when we desire to study the performance of an engine. Such an instrument has been in use for many years with steam-engines, and is called an indicator. It is only, however, comparatively lately that it has been used to any great extent with petrol-engines,

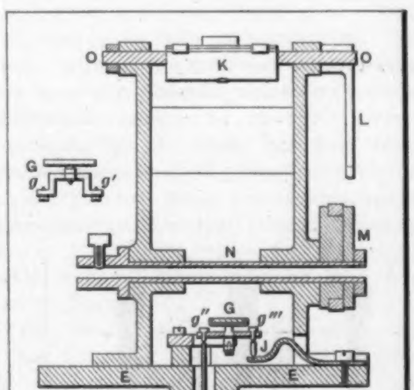


Fig. 10—Section of a manograph used for testing motors

the reasons being that the indicator, as used with a comparatively slow-running steam-engine, gave entirely unreliable results when used on a quick-running petrol-engine. This was due to the weight of the moving parts of a steam-engine indicator being so great that the tracing pencil was unable to follow the very rapid changes in pressure which take place in a petrol-engine. Thus, when an engine is running at 1,200 revolutions per minute, the whole working stroke only takes one-fortieth of a second, while with ordinary strengths of petrol-air mixtures the pressure rises 250 pounds per square inch in 0.003 of a second.

In order to obtain an indicator suitable for high speeds and rapid changes of pressure, the pointer of the ordinary steam-engine indicator is replaced by a beam of light reflected from a mirror, while the piston is replaced by a corrugated metal diaphragm, which plays the part of both piston and spring. The flexure of the diaphragm when acted upon by the pressure existing inside the cylinder is communicated to a very light pivoted mirror, and a spot of light reflected from this mirror by its movement indicates the pressure existing in the cylinder. Such an arrangement alone would give a spot of light which moved up and down along a straight line as the pressure in the cylinder varies throughout the cycle. In order to be able to obtain the pressure at any portion of the stroke, we require to give the spot of light a second movement, at right angles to the first, this movement to be an exact replica of the movement of the piston. In the indicator designed by the author this second movement is obtained by allowing the light, after reflection in the first mirror, to fall upon a second mirror, which is given a rocking movement, about an axis at right angles to the axis about which the first mirror can turn. The rocking movement of the second mirror is produced by a small crank and connecting rod, the crank being rotated at the same speed as the engine.

The actual construction of the indicator is shown in the sectional drawing (Fig. 10). The diaphragm, A, on which the pressure acts is made of steel, and for obtaining the whole diagram, including the working stroke, has a thickness of 0.65 mm. The diaphragm is clamped between two steel discs, B and C, the screwed portion of B being connected to the cylinder by means of a short water-jacketed pipe, the bore of which is 4 mm. A box, F, screws on to the ring, C, and cold water is kept circulating through the space enclosed, serving to keep the temperature of the diaphragm constant. It is of fundamental importance to keep the diaphragm cool in this way, since rise of temperature would decrease the stiffness of the diaphragm, and thus the deflection produced by a given pressure would increase so that the pressure scale of the instrument would be altered.

A concave mirror, G, is mounted on a small and light steel lever, which can rock on the points of two screws, g g', the movement of the diaphragm being transmitted to the lever by a light steel rod, H. The pointed screw, g'' is kept in contact with the rod, H, by the action of a strong spring on another rod, J, which presses against the point of a screw, g'''. By this construction the lever carrying the mirror, G, can rotate about an axis formed by the line joining the points of the screws, g, g', at right angles to the plane of the paper in Fig. 10.

Questions That Arise

CONCERNING THE BEST WAY TO STOP NOISES IN UNIVERSAL JOINTS DUE TO UNDER-LUBRICATION; DRIVING A SUPPLEMENTARY DYNAMO FOR ELECTRIC LIGHT

[261]—What is the best way to stop the noise of chattering universal joints?

The cause of noise in universal joints can usually be put down to under-lubrication, and this again through inaccessibility and getting oneself dirty in the operation. In cases where the cage does not revolve, a large grease cup might be fitted with advantage, so that it is connected to the cage by a flexible pipe and attached on the outside of the frame; then all that is required would be to give it a turn every day or so. When the cage, as is often the case, is made of leather it should be filled with soft grease every two weeks at least, if much driving is done, or say every 1,000 miles. Undue wear may result in a very bad accident if allowed to contine unchecked, as the parts become weak and may break. If the propeller shaft should drop out forward and sprag in the ground the result would be serious if it happened at any speed above 15 miles per hour. A method of guarding against such a thing happening is to fit to the car a device (Fig. 1) that would catch the shaft or torque rod should it become displaced.

Fig. 1—Support to prevent propeller shaft and torque rod from dropping

[262]—How is it possible to drive a supplementary dynamo for electric light?

This is a question that often occurs to the autoist who would do away with oil lamps if he could find some means that would permit him to dispense with the perpetual charging of storage batteries. The dynamo naturally suggests itself but the method of attachment has to be considered. A method that can usually be employed on cars that have a fan belt drive will be seen in Fig. 2. Two belts can be carried on the car so that the fan can always operate and when the dynamo is required the short belt taken off and the longer one substituted. Before the installation is carried out the speed at which the dynamo should run must be taken into consideration and the pulley wheel for same made accordingly. It is necessary to have a storage battery fitted as well, as when the motor is stopped and the dynamo ceases to give off energy it is possible to switch over and keep the lights going till the motor is started again.

This is one of the plans that has been adopted with the Apple Dynamo for lighting, excepting that the belt is supplanted by a sproket chain. Properly installed the Apple idea works like a charm, but if an autoist undertakes to make the application after he gets his car, it is likely that poor workmanship will bring on a quota of noise, all of which can be avoided, however, by consulting the maker's plans and following them.

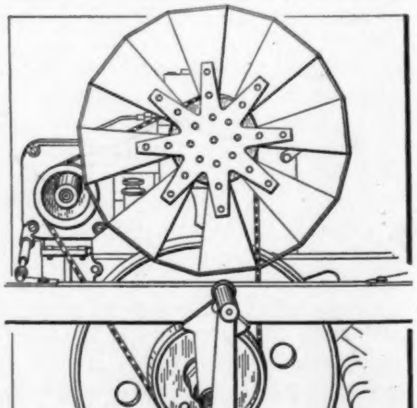


Fig. 2—Showing method of driving lighting dynamo

More Don'ts

A LITTLE COMMON SENSE; A BRIEF FOR SKILL; PRUNING SOME HANDICAPS, AND BRINGING THE MAKER AND THE USER INTO BETTER RELATIONS, ELIMINATING THE THINGS THAT ARE TOO TRANSPARENT TO BE TOLERATED

Don't undertake to be cook and steward of the club; other members may be willing to do some of the work.

Don't stay away just because the things that are being done are not after your suggestion; keep your ammunition in the locker until it is needed.

Don't shoot anyway unless the demand is pressing.

Don't use a pea-shooter when the time comes for action; get a gun.

Don't fall into the suggestion that new automobile legislation is desirable just because it is new; find out who is behind it and just why he wants you to help him pull chestnuts.

Don't forget who is responsible for undesirable automobile legislation when you go to the polls to vote—be sure and vote right.

Don't fail to support the legislation that is wise—vote for the man who is responsible for it.

Don't fail to advocate good roads; this is not to be construed as in favor of the expenditure of good money for bad roads.

Don't overlook the fact that some of the good money that went for roads was not expended as wisely as one would want.

Don't try to stop the building of good roads just because some of the work that has been done is not what you would want to directly pay for.

Don't fool yourself; you pay, if not directly, indirectly; put up a fight for what you pay for.

Don't overlook the fact that the fellow who is trying to "graft it" is a coward; scare him out; all that you have to say is boo!

Don't think that every patriotic citizen (?) is starving on the job; cut out the compensation (whatever it is), and the patriot (of a certain class) will abandon the work.

Don't forget that abandonment is not always a crime; it would be for the good of the service in some cases; try and find the cases.

Don't take it for granted that all public questions are being handled well; there are a few that might be in better hands; you may be able to help the situation along.

Don't go at it like a "bull at a gate or a cow in a china shop"; be practical.

Don't judge your possible buyer by the same standard that you set up for yourself; twins generally hail from the same family.

Don't imitate the rabbit who tried to imitate the roaring lion; the rabbit roared all right, but the coyote said that Br'er Rabbit was "good eating."

Don't suppose that there is no intrinsic merit to an institution that keeps on expanding despite the predictions of the croakers who key their voices to the point of cracking telling how a fact is not a fact.

Don't melt your jewels down to make a golden calf; just limit your purchase to a good automobile; one that can be procured with some of your small hoard; the cost of maintenance must also be considered.

Don't match wits with a man who desires to purchase an automobile; give him what he wants and let him go.

Don't chase after phantoms; land the customer who chases after you.

Don't copy the men who abandoned civilization and laid eggs that would not hatch; vitalize your business; deliver the goods.

Don't try to get the best of your customer; get his confidence; then hold it.

Don't throw your false teeth into a well and trust in the Lord to grow a new set of teeth; nor show your teeth to your customer after you get enough of his money to pay for one of your automobiles.

Don't pump on a tuneless organ; get some musician to key your argument up; sparkle; snap; pave the way with simplicity and decorate the scenery with truth.

Don't scald the hair off of a plain statement of fact; it looks better when it is protected from the Wintry blast.

Don't forget, if you want to catch fish, you must bait your hook; if you want to catch a particular kind of fish, you must tickle the fish's palate, not yours.

Don't fish for a customer for your kind of an automobile, using bait that would attract the discriminating notice of a skate; tell the prospect just what kind of an automobile you have to sell; it may be just what he wants; if you do not know how to tell him, engage some one who will be able to truthfully describe the car.

Don't pay a man to compile a "house organ" and let him palm off garbled material that he "crabs" from technical papers; your customers will have read the original and will know that you offer it second-hand; they might infer that your construction department has the same poor way of doing things.

Don't imagine that the customers whom you hope to entertain don't know the difference; if you think that they do not know anything, you do yourself the injustice of proving that they know more than you do.

Don't pay good money for a bad job; exact an equivalent; it may be had for the asking; be imperative.

Don't intrude on the privacy of a citizen; if a man does not ask you for anything, even a circular, there is no reason to believe that he wants it; if you thrust it upon him you gain his enmity; let him find out what you have; if it is what he wants you would have to put up a stiff argument to keep him from taking it away from you.

Don't despair of letting a man know what you have that he wants; put it under a plug hat on the sidewalk that he uses every day; when he comes along he will kick the hat and a swollen toe will do the rest.

Don't squander a plug hat that costs $10 trying to attract the notice of a buyer unless you have something worth while to sell.

Don't make the mistake of thinking that every one knows all about your business just because you think that you do; such a mistake merely proves that you are not well informed about your own affairs.

Don't get vexed if some one volunteers the truth; it may not sound good to you, but following it might pull you back off the road to ruin.

Don't overlook the fact that your argument may be a straightforward presentation of the facts as they appear to you and still be as one-sided as Patrick's financial prospects; send the argument to the carpet cleaner to be renovated and then try it on the dog.

Don't pay $2 a line for publicity and allow the publisher to make it appear in the paper as if it cost you nothing; the public will say, since it cost nothing, it is worth nothing, and the publisher will be getting you to pay for that which should be paid for by him.

Letters

DISCUSSING MATTERS OF INTEREST TO USERS OF AUTOMOBILES; INSERTING SPRINGS TO TAKE UP PLAY; SAFETY WHEN THE STEERING ROD DROPS; QUALITY OF LUBRICANT MUST SUIT THE SERVICE; TAKING OFF TIGHT WHEELS AND SPROCKETS, ETC.

Taking Up Play in a Propeller Shaft

Editor THE AUTOMOBILE:

[2,412]—I have a car fitted with live axle drive and the propeller shaft is fitted with double-ended cardan joints. It has lateral play back and front and now that the blocks are slightly worn there seems to be a clattering noise when running slow. Could you suggest a remedy to obviate this?

Albany, N. Y. PUZZLED.

We should suggest fitting new blocks and inserting springs as indicated in Fig. 1.

Gear Wheel Setting

Editor THE AUTOMOBILE:

[2,413]—I have an L-type motor with all the valves on one side and the magneto is driven by a gear off the front. While lubricating the timing case the other day—and to do this I have to remove the front plate—the magneto wheel came out. There are some center punch marks on the wheels. How should these be set for the magneto to fire properly? MAGNETO.

New York.

From the marks you should be able to retime the magneto, and to do this the condenser must be removed first in order to see when the armature leaves the magnets. Turn the magneto shaft so that the distance between armature and magnet after the break has occurred is 5-8-inch and the piston on top dead center; then insert timing wheel to mesh with the cam gear wheel.

Fig. 2 shows the gear wheels with the timing gear case removed; the center punch marks should mesh as indicated and as only the magneto wheel has been removed you should have no difficulty in properly replacing it.

To Prevent a Steering Rod From Dropping

Editor THE AUTOMOBILE:

[2,414]—While going over a bad piece of road the other day the steering rod of my car freed itself from the ball at the end of drop lever. Could you tell me the cause of this and what to do to prevent it occurring again? R. A. E.

Yonkers, N. Y.

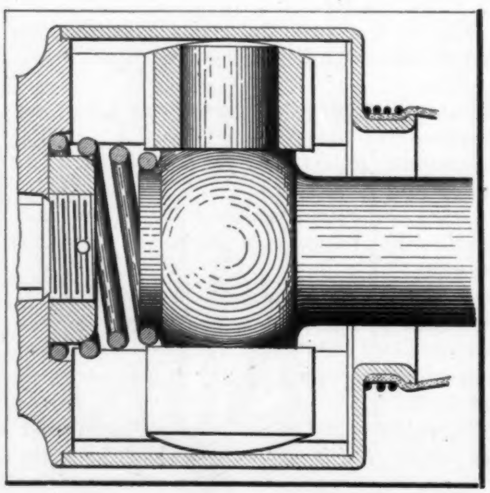


Fig. 1—Spring inserted to overcome noise of universal joints

The cause of your trouble is that the adjustment of the ball and socket joint is not tight enough and when a strong push is transmitted to the springs inside by an obstruction on the road's surface these springs allow the jaws of the socket to open and permit the rod to fall. The remedy is to adjust the springs tighter or have a small amount of the socket ends ground off to allow a better purchase of the ball, but sufficient clearance must be allowed so that when the arm works backwards and forwards it does not touch.

A strap placed in the manner indicated in Fig. 3 will keep the bar from dropping on the road and thereby damaging it and preventing the car from proceeding until the repairs have been made. It should also prevent the rod dropping.

Quality of Lubricant Must Suit the Service

Editor THE AUTOMOBILE:

[2,415]—Please advise what kind of oil you consider best for the motor; also please give me the address of some manufacturer of Panhard oil. FRED B. NEWINS.

Patchogue, N. Y.

This question is sufficiently incomplete to make it desirable to comment upon the views as therein expressed. If the oil is to be used for cylinders of internal combustion motors, this fact should be taken into account; if the service demanded of the motor in a given case is in the summer time, the oil should be relatively viscous; but if the service is to be rendered during the cold winter months, a somewhat thinner lubricant should be selected. On the other hand, if the oil is to be employed in the transmission gear, some account should be taken of the character of the service it must render if satisfaction is to be realized. Likewise, it would be worth while taking into account the kind of oil that would best lubricate a live rear axle, and so on. But if the motor is of the air-cooled variety, rather than of the water-cooled type, surely this fact should be taken into account. And so it may be said all along the line. The first thing to fix upon is the duty that the oil must perform, and then select the kind of oil that is efficacious for that purpose. The idea of buying 80-cent cylinder oil to use in a 20-cent bearing should go extremely well with the type of automobilist who kicks about the cost of maintenance, but exhibits rare intelligence in making the cost as high as possible. There are probably a considerable variety of brands of lubricating oil that might even be purchased at from 20 to 30 cents per gallon, in barrel lots, that would be entirely satisfactory for the lubricating work that must be done in all the joints of an automobile, excepting in the cylinders. These relatively low-priced products, however, should be purchased from the oil vendors who make a specialty of dealing in automobile lubricants, in order that resinous products or other concoctions might be avoided. When it comes to the lubricating oil, tell a reliable oil house what kind of a motor it is that is to be lubricated, and reducing it to a question of cylinder oil, be careful to state definitely the actual facts as they are, and the chance of going wrong will then be reduced to one in a hundred, which is a sufficiently small chance to permit a man of intelligence to cope with it successfully. The address of the

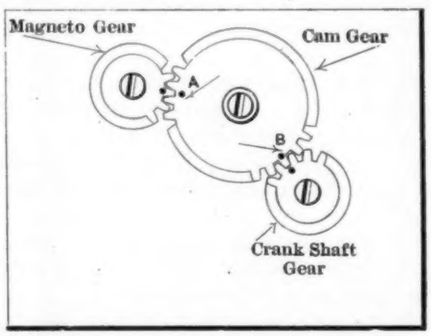


Fig. 2—Sketch showing marks on timing gear wheels

manufacturers of Panhard oil will be found by consulting the index to advertising pages of THE AUTOMOBILE, or The Automobile Trade Directory, but it should be possible to get any of the standards brands of lubricating oil at the nearest dealer in automobile supplies.

Baumé Degrees to Specific Gravity

Editor THE AUTOMOBILE:

[2,416]—Can you inform me how to turn Baumé to specific gravity? METRIC.

Montreal, Canada.

$$\text{Specific gravity} = \frac{145}{145 - {}^\circ\text{Baumé}} \text{ at } 60^\circ \text{ Fahrenheit.}$$

e. g. 15.0 Baumé—1.115 specific gravity.

Length of Spark Plug Gap

Editor THE AUTOMOBILE:

[2,417]—Some time ago I set the points of my spark plugs at 1/64th inch and found that the engine did not run as well as when they were set at 1-32d inch. One or two of the cylinders seem to miss occasionally. Could you tell me the reason for this? H. L. LONG.

Richmond, Va.

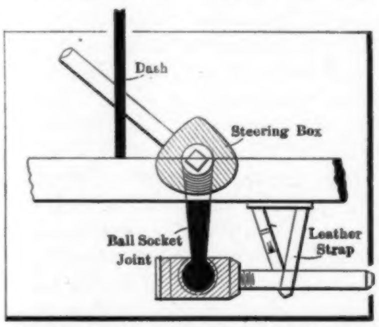


Fig. 3—Strap to support steering bar in case of accident

The cause of the misfire is not so much due to the plugs as the mixture. The spark that one sees when the plug is held outside the cylinder is much attenuated when under compression, and unless the mixture is good the current that bridges the gap is not sufficient to cause an explosion, whereas the 1-32d is. A slight variation of the mixture might prove the running of the motor.

How to Remove Tight Wheels and Sprockets

Editor THE AUTOMOBILE:

[2,418]—What is the best method of removing the rear wheels of my car? They are keyed to the shaft and I have no wheel remover. I have tried striking blows on the inside of the wheel with a hide hammer, but the action does not improve the paint and, furthermore, does not remove the wheel. A SUBSCRIBER.

Trenton, N. J.

A method of removing wheels is shown in Fig. 4, and the method of application is as follows: Remove the hub cap and fix some stout rope around four of the spokes as near the brake drums as possible. The lifting jack is then unscrewed to its smallest lift; place it with the head against the end of the axle, but if it does not touch owing to the size of the hub cap, insert a block of hard wood, as shown in illustration. Secure the rope round the base of the jack and unscrew, and the wheel should come off easily. The same method can be employed for removing chain sprockets.

Metal for Connecting Rod Bearings

Editor THE AUTOMOBILE:

[2,419]—I purchased a touring car in May, have run it 25,000 miles. About a month ago had to have the connecting rods on the crankshaft adjusted, I suppose on account of the bearings wearing and causing knocking in the crank case. the same trouble has come back and the machine is now at the agent's to be adjusted again. What is the best metal to be used for bearings on the connecting rods? They spoke of replacing with bronze. Which is the best make of bearing for this purpose?

JOHN P. TULL.

Philadelphia.

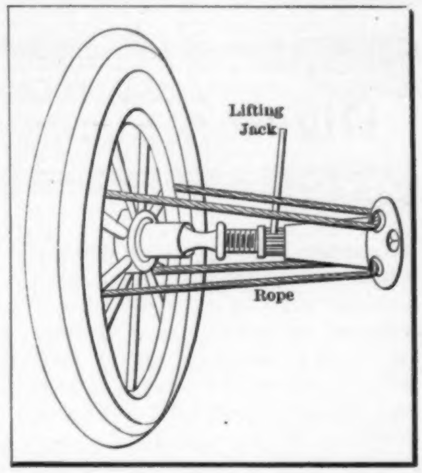


Fig. 4—Means of removing tight wheels and sprockets

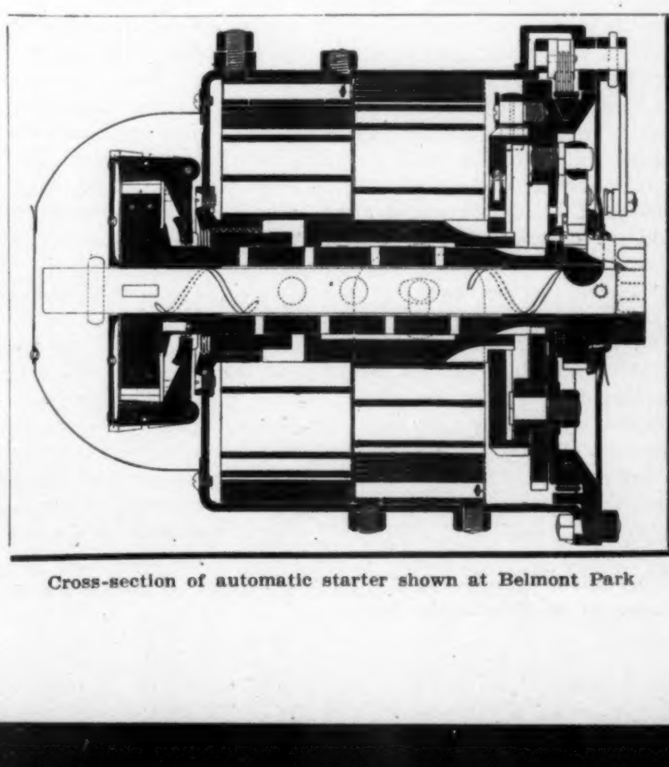
A very good metal for bearings, and one that should give satisfaction is Fahrig metal. The composition of this metal is substantially 90 per cent. tin and 10 per cent. copper. There is a very small amount of impurities in either metal, but not sufficient to materially alter these percentages. New metal must be used, otherwise the proportions cannot be correctly ascertained. This table shows some of the properties of Fahrig metal:

Crushing strength..........	38,500 pounds per square inch
Tensile strength............	20,500 " " " "
Elastic limit..................	3,600 " " " "
Molecular temperature.......	1,000 degrees Fahrenheit
Anti-friction angle..........	77 degrees

In casting Fahrig metal it should be covered with charcoal and heated to a dull red before "teeming."

Automatic Starter Shown at Belmont Park

One of the devices that attracted unusual notice at the automobile exhibition at Belmont Park was the automatic starter which was being demonstrated by the Auto Improvement Company of New York. The starter belongs to the flux spring variety, and the details of the same are brought out in the cross-section here given, showing two flat steel springs of the coil variety, lying alongside of each other in a dust-proof case. The shaft takes the place of the ordinary starting crankshaft and does the work just as it would be accomplished by a chauffeur in the ordinary process of cranking, the only difference being that the effort is due to the energy stored in the flat springs, thus making it unnecessary for the driver to exert himself.


Cross-section of automatic starter shown at Belmont Park

Digest

BRAKING TRUCKS WITH THE EXHAUST—DETAILS ON CASEHARDENING—FATIGUE OF COLD-ROLLED MATERIAL—PENETRATION OF QUENCHING EFFECTS—WHEN IRON DOES NOT RUST—CAST ARMOR PLATE—ESTHETICS OF ENGINEERING—WRITING ON GLASS

A motor brake, recently patented, is employed on the trucks turned out by Gräf & Stift, A. G., a Vienna manufacturing concern. The principle is similar to that used for reversing the motor in several American marine power plants, the camshaft being adjustable longitudinally by means of a shifter fork, and the exhaust cams are arranged with truncated cone extensions at one side leading to a circular cam of the same radius as the non-eccentric portion of the main cam. At any point in the cycle the exhaust tappet roller may thus be let down so as to throttle or completely block the exhaust, accordingly as the shaft is shifted part of the width of the cone or its entire width. The device is said to work satisfactorily, offering the advantage that all organs transmitting the braking effort are engaged gradually.—*Der Motorwagen*, Oct. 1.

Strength of a casehardened shell, according to Leon Guillet, the well-known metallurgical specialist employed in the laboratory of De Dion et Bouton, is independent of the carbon content of the steel below the shell, the core. The best casehardening results he obtains in practice, however, from a steel not exceeding 12 points of carbon, 30 of manganese and 30 of silicon. A steel of this composition has a tensile strength, annealed, of less than 38 kilograms per square millimeter (about 39.596 pounds per square inch) and an elongation of 30 per cent. The best cementation compounds are at present (1) a mixture of 40 per cent. charcoal and 60 per cent. carbonate of barium, which operates through the carbon monoxide developed by the heat, (2) a mixture of ferrocyanide of potash and dichromate of potash, and (3) a mixture of 10 per cent. of common salt with 90 per cent. of charcoal. The latter is found very effective, though its chemical reactions are still obscure. It is important for the value of a compound that it does not cause concentration of carbon in the surface film of the work but penetrates well, so that brittleness of the surface and subsequent heat treatment may be avoided. Pieces intended for wear and impact may be hardened to a depth of 1-2 to 8-10 millimeters; those exposed to steady pressure should have no less than 1 millimeter to 1 1-4 millimeters thickness of the shell. In practice there is a distinction between casehardening at low temperature (850 degrees to 900 degrees Centigrade) and at high temperature (1,000 degrees to 1,050 degrees Centigrade, rarely 1,100 degrees), and the distinction is justified by the corresponding difference in the subsequent heat treatment. Steels cemented at 850 degrees are cooled to 750 degrees and then quenched. Those cemented at higher heat require two quenchings, first at 1,000 degrees in water, serving to give the core the finest possible grain and the toughness which goes with fine grain, secondly at 750 degrees to give hardness to the shell. These rules rest on the following principle: The brittleness of a steel grows with the temperature and the duration of the heating, provided this temperature is above that of the lowest transformation point. To remove the brittleness, the steel must be reheated to above the highest transformation point and then slowly cooled. But in the case of very mild steels cooling in water has the same effect. By the double quenching, all free cementite in the hardened shell disappears, if the latter is not thicker than 2 1-2 millimeters and, besides, the core becomes perfectly homogeneous. However, if the carbon of the steel is not at least 12 points (a "point" being 1 per cent. of 1 per cent.), the core becomes hard and brittle. On the other hand, the manganese must be less than 30 points, to keep the shell from getting too flinty. The grain of a fracture, which is often looked to for deciding the quality of the cementation, depends mostly on the manner of fracturing.—*Revue de la Métallurgie*, July.

When iron and steel are maintained at heats from 65 degrees to 800 degrees Centigrade the ferrite grains very rapidly develop a formation of coarse crystals, as observed by Stead. This fact is now supplemented by the observation that the formation of coarse crystals is particularly rapid if the material has been cold-rolled or drawn. One half of a bar of soft steel was drawn to a thin wire and then subjected to a temperature of 650 degrees to 800 degrees, at the same time as the unworked half of the bar. After both had cooled, the drawn material showed much larger crystals at fractures than the unworked piece, and microscopic examination corroborated the test. The effect of the crystalline formation is much less noticeable at tensile tests than at impact tests on nicked bars. Many heretofore mysterious fractures are explained through the facts mentioned. —G. Charpy in *Comptes Rendus de l'Académie*, Aug. 1.

Data on the penetration of the hardening effect with different quenching mediums formed the subject of a paper recently read by Mr. Grevet before the Society of Mineral Industry. The author started from the assumption that the action of a quenching liquid must depend on three factors, (1) the conductivity of the liquid, which decides the surface hardness produced in any given steel, (2) the size of the work, and, (3) the conductivity of the steel, which jointly decides the relations between surface and core hardness. He undertook experiments for determining by test the surface hardness and the core hardness reached in an assortment of bars of plain carbon steel varying in diameter from 12 to 60 millimeters, and quenched with cold water, oil, boiling saturated brine, and with air, and presents the results in tabulated form. He also gives diagrams of the penetration in chrome-nickel steels of different compositions.—*La Technique Moderne*, September.

Pure iron does not rust, hence almost pure iron (from electric furnaces) is used for tinplate by an American company whose claims to special merit on this ground met with skepticism in Europe until the Chemical Society in London had listened to a paper on the same subject from which it appeared that pure iron and pure water in combination gave rise to no oxidation.—*Proc. Chem. Soc.*, June 29.

To write on glass, use an aluminum pencil.—Chemical Notes in *La Technique Moderne*, September.

Considering the enormous cost of rolled armor plate, under all circumstances the heavy additional cost of establishing new producing plants when the armor plate must be of the caliber required for the Dreadnought type, the world will have to come to cast plate hardened on both sides, which can be made without new installations and is more readily turned out in the suitable shapes.—From article by Victor Tilschkert in *Oest. Z. f. Berg. und Hüttenwesen*, Aug. 6, 13 and 20.

"The real architect of this age is the engineer," says Joseph A. Lue, among other striking remarks with regard to buildings and bridges appearing in a recently published book entitled "Esthetics of Engineering" (*Ingenieur Aesthetik*). And, referring to the failure of modern architects in not producing works of artistic merit, embodying the spirit of the present age, but continuing to "rob the art treasuries of the past," he holds that this result is only natural when the architect or artist is not trained also as engineer and when the engineer has experienced no development of his artistic insight. "Modern civilization is not reflected in our architecture," he says, "but in our vehicles, automobiles, ships, trains. When the question is of the real style of this age, here is where it is found. There is need of bringing art and engineering nearer together, as they were once."—*Technik u. Wirtschaft*, September.

Troubles of Battery Ignition Systems

(a) Run down battery.
(b) Broken plug.
(c) Dirty plug.
(d) Points of plug too far apart.
(e) Points too close.
(f) Bad earth wire.
(g) Short-circuited wire.
(h) Short circuit in coil.
(i) Burnt condenser.
(j) Short circuit in timer.
(k) Bitted contacts of platinum trembler blades.
(l) Timer roller jumping contacts.
(m) Weak spring on timer.
(n) Loose connections.
(o) Chafed wire.
(p) Sulphated terminal of battery.
(q) Battery will not hold charge.
(r) Short circuit between coil and plug.
(s) Water or damp in coil.
(t) Faulty windings.
(u) Trembler contacts give off metal one to the other.
(v) Faulty switch.
(w) Loose platinum points.
(x) Unusual buzz inside coil.
(y) Wrong adjustment of platinum contact points.
(z) Broken terminal on coil.

How to Fix Battery Ignition Troubles

(a) Charge four-volt batteries to 4.3 minimum.
(b) Fit new plug or if porcelain broken fit new one.
(c) Clean with gasoline and tooth brush.
(d) Set to between 1-32 inch and 1-16 inch.
(e) Open slightly with blade of penknife.
(f) Clean around both and scrape wires.
(g) Replace wire by new piece at once.
(h) Send coil to makers.
(i) Caused by batteries of too high voltage. Return to maker.
(j) Clean out pitted oil and refill with fresh.
(k) Clean with fine file, perfectly level.
(l) Due to worn fiber; take off timer and have it turned true.
(m) Fit new and stronger spring or shorten.
(n) Go over all connections once a month and fit lock nuts.
(o) Fit new wire and secure same with staple.
(p) Clean; finish with fine emery paper; when the battery is not in use cover terminals with vaseline.
(q) Plates buckled or loose paste causing short circuit; test specific gravity.
(r) Poor insulation or broken wire inside; fit new wire.
(s) Put coil wrapped in flannel in slow oven; more a job for coil expert.
(t) Beyond owner's control; return to makers.
(u) Voltage too high for coil; change poles of battery.
(v) See if it insulates properly; look for crack in vulcanite.
(w) Have them resoldered with silver.
(x) Probably due to faulty insulation of the windings.
(y) Adjust with least clearance to give a high-pitched tone.
(z) Buy a new coil.

Care and Repair of Tires

SECOND INSTALLMENT, ILLUSTRATING PROFESSIONAL METHODS OF REPAIRING; DISCUSSING THE BEST WAY TO OBTAIN THE MAXIMUM RESULT

TAKING further advantage of professional methods, Fig. L presents two operations, one of which, A, involves a sectional repair, and B shows the vulcanizing being done on a section of a tire. This illustration indicates that a section can be put into an outer casing, no matter how badly it is damaged, provided, only, that the fabric is in good condition. Fig. M shows the wrapping process. The tire is mounted on a shaft S, and is being wrapped by cotton fabric F, which is the final operation before placing the same in the vulcanizing kettle. The spindle S has a loose pulley P1, upon which the belt B1 runs, excepting when it is desired to rotate the shaft S, in which event the belt is slid over onto the pulley P2. The device is almost primitive in its simplicity, requiring nothing but the standards and a piece of cold rolled shaft with the spiders S2 and S3 upon which the tires are mounted when they are ready for the wrapping operation. It would almost pay the private owner of a car to provide such facilities in order that he might undertake his own repairs, but in the absence of such utensils, it is a question as to whether or not it would be feasible to try to do the work.

When the tires are wrapped they are then placed in the kettle K1, hanging on the hook H1, after which the cover C1 is put into place and bolted tight against the gasket G1, when steam is turned on and the vulcanizing process begins. The steam is generated in the boiler B1, maintaining the same at about 45 pounds per square inch, which corresponds to a

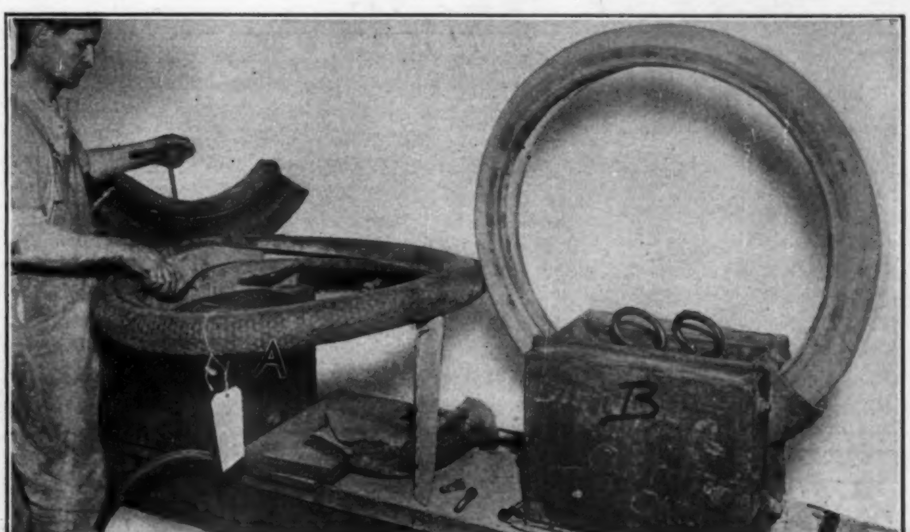


Fig. L—Depicting the Method of Curing an Outer Casing after a Sectional Repair; also Showing the Method of Procedure in Making the Repair

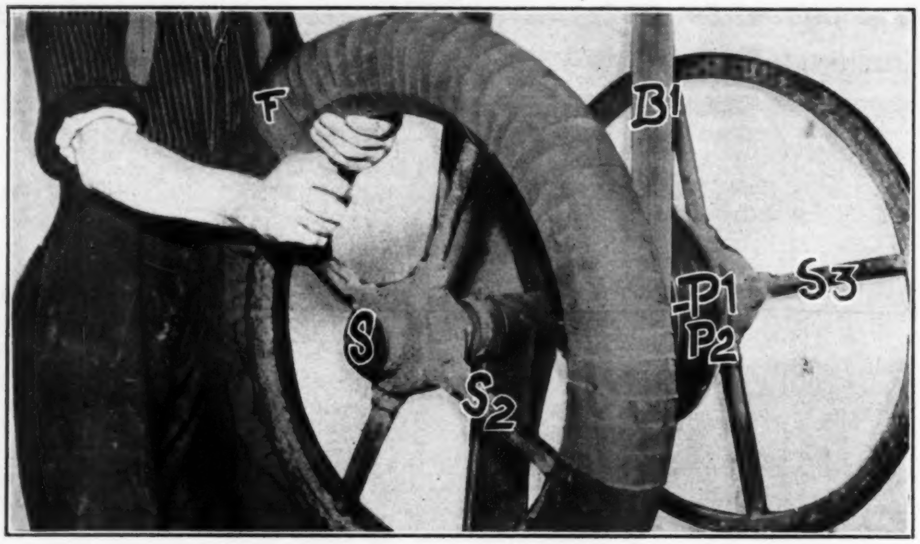


Fig. M—Wrapping the Outer Casing after the Repair Is Completed Prior to Placing the Same in the Vulcanizing Kettle

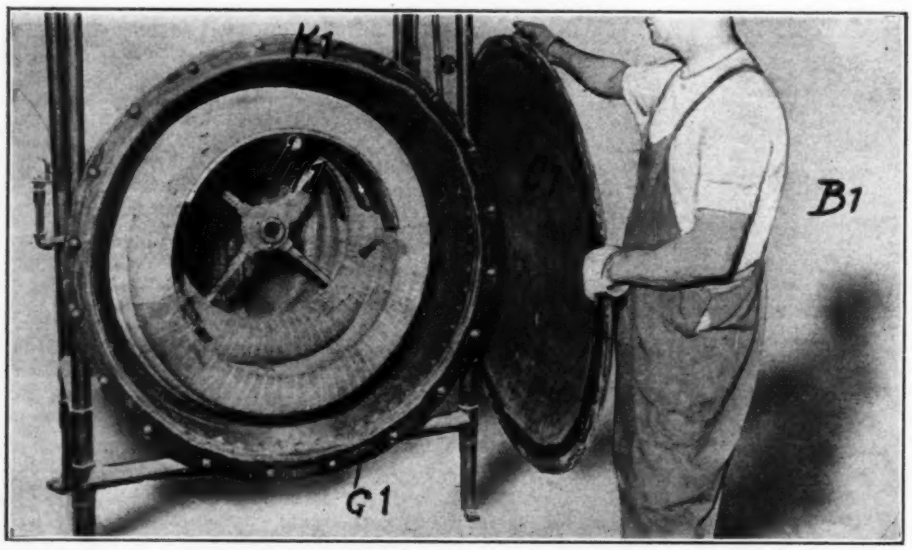


Fig. N—Showing the Vulcanizing Kettle Open and the Wrapped Outer Casings Resting on a Hook Within the Cover about to Be Bolted on

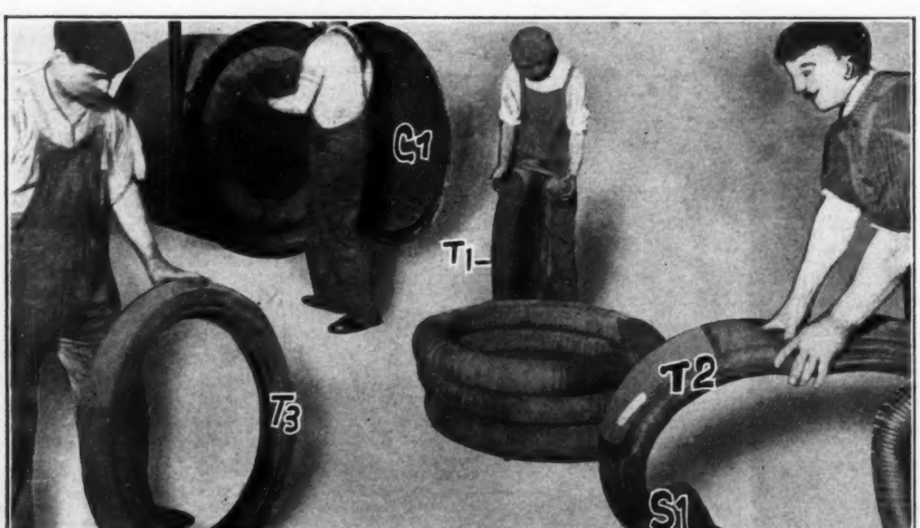


Fig. O—Showing the Vulcanizing Kettle with the Cover Open after the Vulcanizing Process Is Completed and the Wrapped Tires Being Removed Therefrom, Some of Which Are Being Unwrapped, the Spring Being Taken out and the Finished Job Ready to Go Back to the Owner

temperature of 274.3 degrees Fahrenheit, at which temperature a kettle cure is realized in 45 minutes, 20 minutes of which are allowed for the equalization of temperatures.

If a hard cure is desired the steam is raised to 55 pounds per square inch, which corresponds to a temperature of 286.9 degrees Fahrenheit, and the time allowance is increased to 1 1-4 hours, 25 minutes of which is the allowance for equalizing temperatures. If a semi-cure is desired with the steam pressure at 55 pounds per square inch the full time allowance is 45 minutes, 25 minutes of which is taken in the equalization of temperatures. It will be understood that vulcanization will take place over a wide range of temperatures; if the temperature is relatively low the time required to bring about a more or less complete state of vulcanization will be relatively long. In hastening the vulcanizing process it is necessary to avoid going beyond a certain temperature; 275 degrees Fahrenheit is an approximate safe maximum, and the novice in undertaking to make repairs, if he uses an electric vulcanizer, must so regulate the temperature that it will not rise beyond the safe point.

When steam is employed as the source of vulcanizing heat the steam pressure can be maintained at substantially 55 pounds per square inch without danger of serious fluctuation, and this will be particularly true if the steam boiler is large enough and the volume of water therein contained is sufficient to prevent rapid fluctuations in the pressure, it being the case that the greater the volume of water the longer it will take to vary the temperature of the same, hence the less marked will be the pressure changes in a given time.

But when an electric vulcanizer is used it is possible to raise and lower the temperature at a rapid rate, and in order to avoid these rapid changes in temperature it is necessary to watch the vulcanizing heater until it has attained its maximum temperature, regulating the flow of current from time to time until by the thermometer it can be shown that the heat condition has reached a stable level and will remain at that point throughout the balance of the process. There are two conditions that interfere and tend to cause heat fluctuations, one of which lies in the change in resistance of the electric heater for temperature variations; the resistance in ohms of the conducting wires in the heater increases considerably with increasing temperature, and the flow of current in amperes must be adjusted to suit this change in resistance, all of which takes a little time, because it takes time for the heater to rise to a stable level, and the inexperienced autoist is likely to overlook this condition and go away from the vulcanizer before it is safe to do so. The remaining factor lies in the inac-

curacy that is inherent in the average thermometer. It is extremely important that the electric vulcanizer purchased and used for this class of work shall be provided with an accurate thermometer, by means of which the autoist will be able to determine the real temperature that exists during the vulcanizing process. It is not uncommon to find commercial thermometers that will give false readings of 10 or 15 degrees at this range in temperature, and it will be apparent to any one that if the safe temperature is 275 degrees Fahr, a difference of 10 or 15 degrees, or say 290 degrees Fahr., if made the working temperature, spells failure.

When the kettle is open, after the vulcanizing process is completed, the tires are removed therefrom as shown in Fig. O, with the cover C1 removed; one of the tires T1 is having the wrapping undone, another of the tires T2 is having the spring S1 removed and a third tire T3 is shown in the completed state. Fig. P shows a pair of tires after they were repaired, in which the case C1 has a patch P1 and the case C2 has a patch P2. The work is extremely well done, and a tire repaired in this way should give a good account of itself, but the amount of service to be expected depends absolutely upon the condition of the old fabric. There should be no question at all about the quality of the new patch; it will be good if the fabric used is of a good grade, and if the repair rubber is of the right quality. But the new patch depends for its utility upon the quality of the old fabric to which it is attached. If the new patch is to make good the ills of a blow-out, the first question is, What caused the blow-out? If it is on account of rotten fabric, and the condition of decay is general throughout the whole tire, the same rotten fabric will blow out again, perhaps in a new spot, but more likely at the junction of the new patch and the old fabric. If, on the other hand, the tire is relatively new and the fabric is in good condition, the repair will be dictated on account of damage done by some means not assignable to tire rot. This patching process, under the circumstances, is really one to be applied to a tire that is in good condition excepting for the result of good usage, the assumption being that the tread may be damaged at one or more points by cutting or otherwise, but that the fabric in the remaining part of the tire will be stout and in fettle to do further work, so that the patch will have something to hang on to, in which event it is worth while to consider repair cost.

Inner tubes are legitimate subjects for repairing up to the time when the rubber compound shows a general condition of checking and a marked falling off in the elasticity of the rubber. Fig. Q shows a tube at A with the repair tissue T1 ready for the vulcanizing process; at B after the repair part is inserted and rolled

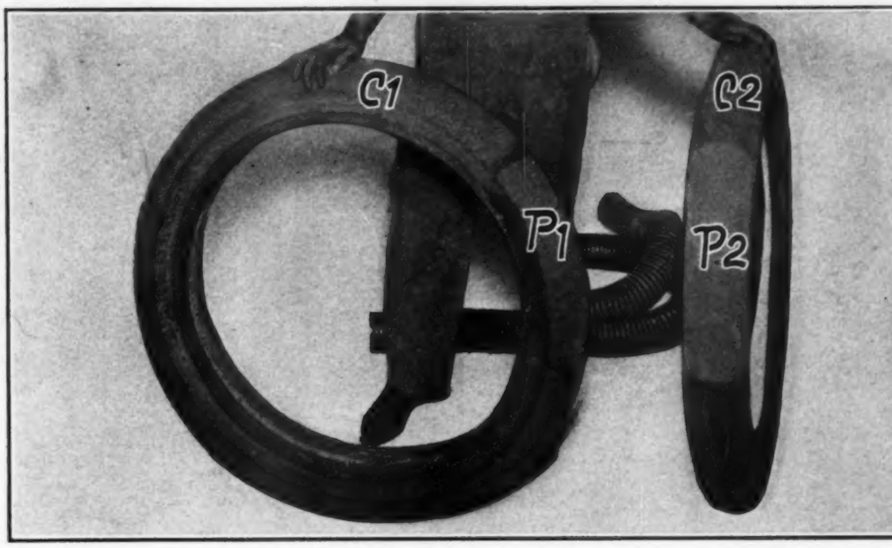


Fig. P—Presenting a Pair of Patched Tires, Showing How Well the Patches Are Made

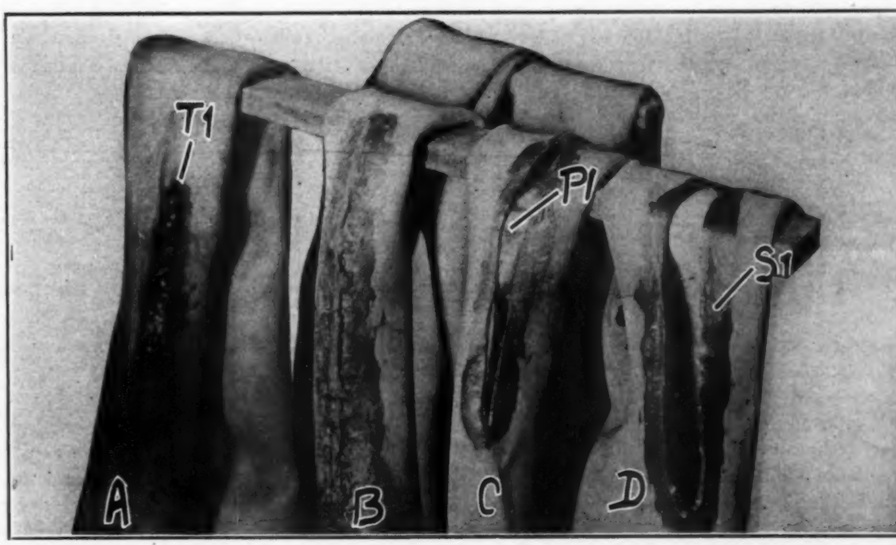


Fig. Q—Four Operations in the Patching of Inner Tubes. A—Ready for the Vulcanizer; B—The Tube Rolled Down; C—The Patch Inserted; D—Ready for the Patch

Fig. R—Working in Vulcanizing Gum in a Hole in an Inner Tube Undergoing Repair

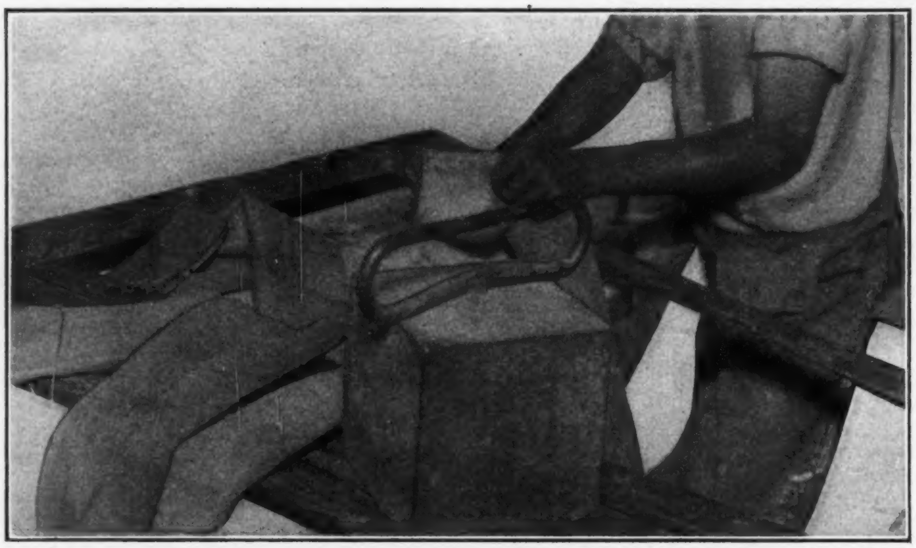


Fig. S—Inner Tube with Patching Completed Inspected and Ready to Go Into Vulcanizer

down; at C with the repair part P1 inserted and at D with the edges of the opening solutionized at S1 all around. Prior to solutionizing, it is necessary to cut away all the damaged rubber, making the opening as large as may be, provided the remaining rubber is sound. The surfaces are then sandpapered down, removing the exterior coat, and when the body of the rubber is in sight it is then roughened, after which it is cleaned, using benzine or other rubber solvent for the purpose, and it is then solutionized, and it is important that the solution employed be of a character of rubber gum that accords with the quality of the rubber of which the tubes are made. There is almost no limit to the extent to which inner tubes can be repaired provided they are in good condition from the point of view of the quality of the remaining parts of the tubes, assuming that the operations are performed with care and that the vulcanizing process, which must invariably follow, is properly done. Fig. R shows the operation of working vulcanizing gum into a hole in the tube. The average amateur does not take the necessary pains in performing these operations; with him it is enough to stick a piece onto the tube to be repaired, exerting a little hand pressure and clamping it down with a clothes pin, hoping, perchance, that a little dirt, some grease, a bit of a patch and a jab of gum will adhere to the tube and keep the wind in—it will not.

When the inner tubes are properly patched, and it can be seen by a careful inspection that the patch is well stuck to the surfaces all around, it may then be vulcanized, as shown in Fig. S.

Timing the Motor

DISCUSSING THE RANGE OF TIMING IN MOTORS AT VARIOUS SPEEDS; PRESENTING A CHART OF SETTINGS OF VALVES TAKEN FROM ACTUAL PRACTICE

It is proposed in a series of diagrams to explain the methods of timing employed in a number of well-known motors. The small dots indicate the positions in degrees to the dead center at which the different operations take place. The variations of the timing operations are primarily due, as the curves indicate, to the increased maximum speed of some motors compared to others, and while some motors can be made to run better by a different setting of the valves, allowing them to open or close earlier or later, as the case may be, nevertheless, the two primary considerations that the autoist has to consider are the opening of the exhaust and the opening of the inlet valves. The actual shape of the existing cams will not permit any variation of the settings once those mentioned have been determined.

From the charts a mean timing for all motors can be found, and this is represented by the following:

Lag of inlet valve opening............degrees, 12.16
Lag of inlet valve closing............degrees, 25.32
Lag of exhaust valve closing..........degrees, 5.8
Lead of exhaust valve opening........degrees, 46.20
Advance of ignition in degrees.............. 31.15

The point that varies more than any other is the lead given to the exhaust valve opening and, as above mentioned, the lag of closing of this valve is governed by the opening. One is immediately confronted with the question of overlapping of the exhaust closing and the inlet opening. The faster a motor turns it is logically to be expected that the exhaust will require a greater lead, but in practice this is not always the case, as the excess pressure caused by the greater speed is overcome by larger valves and larger ports in the original design. An example of this can be found in high-speed motors overcoming excessive back pressure by fitting two and sometimes three exhaust valves to each cylinder. The only type of valve that can be reckoned with other than the ordinary poppet valve is the sleeve type as fitted to the Knight motors. In this case the two valves are open at the same time for a period of 20 degrees. Inlet opens at dead center, exhaust closes at 20 degrees after dead center. Exhaust opens at 55 degrees before lower dead center on the firing stroke and the inlet closes 45 degrees up on the compression stroke.

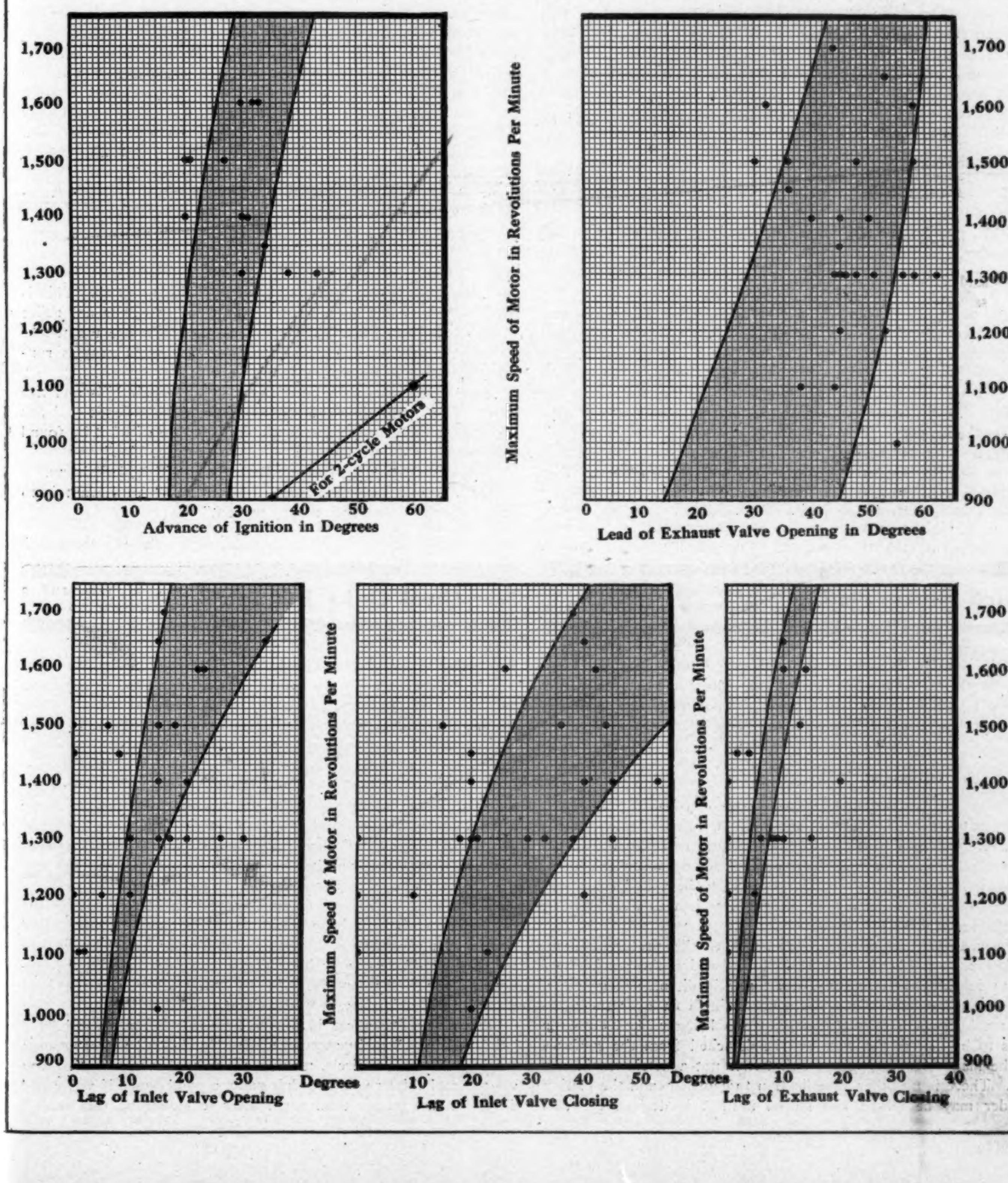
It would seem that it is advantageous to close the exhaust valve after the piston has arrived at the top dead center for the reason that there is bound to be some pressure, however small, left in the cylinder, and by leaving the valve open for a few degrees better scavenging will result. As an example of a motor in which the exhaust closes on dead center and the inlet opens almost immediately after, what takes place?

The entire pressure of the exhaust has not been expelled and there still remains a small amount in the cylinder. The moment the inlet opens this pressure seeks an outlet through the intake manifold, causing a strangulation of the incoming gases; but if a larger amount of time is allowed to transpire the remaining exhaust pressure will be reduced and a small vacuum produced instead; then the incoming gases will be sucked up faster and the continuation of this effort will be felt during part of the compression period, accounting for an increased lag of the inlet valve closing. So much for when the valves are not open at the same time. The question then is, What happens when the two valves are open at the same time? The flow of gas in the exhaust manifold does not cease immediately and the continued flow from the cylinder can be expected to follow that in the exhaust manifold. Further, in opening the inlet valve before the exhaust the former is brought to the position of being nearer full open when the exhaust closes than if it were to open afterward, obviating any back pressure and doing away with any vacuum.

Chart for Determining the Proper Timing of 4-cycle Motors at the Several Working Speeds

Instead of dealing with the five functional conditions (a) opening of the inlet valve, (b) closing of the inlet valve, (c) opening of the exhaust valve, (d) closing of the exhaust valve, and (e) ignition of the charge, in a single chart, it is so contrived here that each of the functional parts may be handled separately, with the expectation that it will lessen the complication involved and enable the average autoist to obtain a better understanding of the benefits to be derived.

The ignition chart shows a range of between 17 and 23 degrees advance at 900 revolutions per minute of the crankshaft, increasing to a maximum of 38 degrees at 1,700 revolutions. As a rule the ignition is subject to variation at the will of the operator, and all that is necessary is to remember that the higher the speed the greater the advance should be, keeping within the limits as here given. In the remaining diagrams an attempt is made to indicate approximately how the opening and closing of the valves should be regulated according as the speed is high or low, but it must be remembered that the design of the motor will have an influence upon the performance in view of a given valve setting, and in adjusting the valves some account should be taken of the characteristics of the motor. As a rule, the maker of a given motor will indicate just what is the best setting of the valves, but even then the charts as here given will tell the user how to proceed in case it is desired to experiment, with the intention of obtaining a better result if the same is feasible at all.



Bateye as Chauffeur

OLD WALT, ENVIOUS OF THE SUCCESS OF SECOND-STORY WORKER IN NEW FIELD, TELLS DETAILS OF HOW A FINE JOB WAS LANDED

"FLAHERTY," exclaimed Old Walt, wiping his mouth with the back of his hand and approaching the café proprietor, "this chauffeur game must be a beaut.

"I have been thinking since yesterday of passing up the old hack and settling down to a glittering existence as a chauffeur. You recollect I showed you that piece in THE AUTOMOBILE some time ago about the fellow who advertised for a chauffeur and specified that the applicant must have all the qualifications of a college professor, butler, stevedore and a few other callings? I was discouraged when I read that piece, because I knew I could never fill the bill, but since I met a fellow who landed a job just about like the one the advertisement promised, I am on my feet again, sparring for wind and gathering myself for another punch."

"Don't you change," cautioned the proprietor as he felt for the hack driver's special bottle, "you're a good kebbie, but you'd be running a risk to switch the cut at this stage of the game."

"Well, just let me tell you about this duck who got the job," said Walt, pouring out a drink. "The ad called for about the same kind of a man as the one in the story in THE AUTOMOBILE, except that he didn't need to act as secretary to the boss. He had to be good and careful, and a mechanic, and willing, and know French, and act as valet and be ready to work any time. I read the ad and passed it up as too tough for me, but Bateye Wilson, who had just finished an 11-month job on the Island for that Harlem second-story enterprise, was the successful applicant. Bateye certainly knew mechanics. I never knew a man who could handle a ratchet drill with the grace of Bateye.

"He went up to the man who put in the ad and satisfied him that he was just what the doctor ordered. He got a license from Kansas City Riley, who took the examination in August for the whole gang and is doing pretty well now selling them. It is funny to hear Kansas City tell how he copped out those licenses, but as somebody or other says, that is another story.

"Bateye can talk all kinds of Greaser, and he found out in a minute that the Boss could not; so he was safe in spreading himself along that line. He had the most beautiful recommendations you ever saw, giving telephone numbers and a lot of other punk. He asked the Boss to 'phone and satisfy himself that he had worked for Mr. Van Payne or some one else. Bateye says it was worth a front seat in a $2 show to see the performance. The boss fell for the recommendations and called up Mr. Van Payne. For the time being—for the occasion, I might say—the leading role of Mr. Van Payne was taken by Slippery Casey, who was planted in the saloon which had the 'phone number given in the recommendation. He said a few kind words for Bateye and cinched the job for him by inviting the Boss to have dinner with him just as soon as he returned from Kamchatka, where he was going at 10:30 o'clock.

"That's about all. Bateye won't hardly look at me now when he is out joy riding with a bunch of glittering wit and beauty. He is getting "it" in bunches. He tells a friend of mine that the Boss only gets to use the car about twice a month. This is because it is in the shop most of the time Bateye is not using it personally and because Bateye says his hands are too tender to steer for the Boss, especially as long as the Subway is running and there is no real, pressing need of it.

"Bateye gets a healthy percentage on the repair bills and tire bills; has a royal time riding the girls and his friends and has the Boss buffaloed with a strangle-lock because of what he found out about him on the few trips he actually drove him."

"But why do you get sore on Bateye's luck?" said Flaherty.

"Me, I'm not sore on Bateye," said Walt. "All I want is to get a whack at that soft money myself."

Quick Nickel Plating

The Average Autoist Would Prefer Nickel-Plated Trimmings

ADJUNCT to the tumbling barrel method of burnishing brass work of automobile bodies, the latest method of nickel plating is worth trying. In this process all that is necessary is to prepare the rubbing powder and apply it, using a wet rag. The powder is compounded of:

Nickel ammonium sulphate	60 parts
Metallic magnesium	3 parts
Chalk	30 parts
Talcum powder	7 parts

The process is electrolytic; magnesium, being highly electropositive, forms the anode, while the surface to be coated forms the cathode. Due to the "local action" set up when this compound is applied to the metallic surfaces to be plated the nickel in the solution will plate onto the surfaces just as well as when the plating is done in the conventional way.

The metallic magnesium particles must be protected from oxidation, and this is accomplished by bathing the particles of magnesium in a bowl of any wax that will dissolve in gasoline, as resin. The wax will form a protecting coat over the magnesium, but when the plating mixture is being rubbed onto the parts to be plated, the wax will be detached from the surfaces of the magnesium particles so that it is not a detriment in any way. There is no other complication to consider, and the plating powder may be mixed and stored until it is desired for use.

Nut Quad Quits His Job

A Tale of Woe and a Quick Getaway

"FAKE!" yelled Nut Quad, "I will not go on in this way, trying to make the public believe that I go to the races and to the other events, gather the news, and then repair to the editorial *sanctum sanctorum* and divest myself of that with which I was invested in the shape of real facts and the live happenings of the day. Here I am trying to write a story of the Quaker City (Fairmount Park) event without a leg to stand upon; I was not there; you were not there; there wasn't anyone there from this punk joint, and when this sheet is driven out upon the street to live or die, survive or perish, it will go up against the real thing from another quarter of the globe, and the end will be as plain as the nose on your face.

"I'm willing to write a column around an idea as big as the dent of a gnat's heel, I am," said poor Nut Quad. "I don't mind poring over a cord of stale clippings day after day, I know they are cheaper than carfare; it's a cinch to say in the editorial column of the paper that we give the news; if you say it loud enough most animals will take it for Gospel.

"I've stuck like a cat in a tree that was being stalked by a bulldog, I have," said watery-eyed Nut Quad. "You strut around, beating a path in a circle, making a few softies believe that you are the real thing; you wouldn't make a good paper if you could do it for less money than you scatter to gather up this sheet."

Steel Bank Cars

ILLUSTRATING THE BELLAMORE ARMORED MOTOR CAR FOR USE BY BANKS IN THE TRANSFER OF FUNDS—EQUIPPED WITH PERFECT BANKING FACILITIES AND PROTECTED BY HEAVY BOLTS AND LOCKS

FUNDS must be transferred by banks, trusts and express companies by day and by night through all parts of congested cities, and heretofore it has been more or less of a serious problem with a considerable cost feature and a measure of safety that is barely up to the minimum requirement, with here and there an attack and a contingent loss. The Bellamore armored car as here illustrated represents the latest endeavor in the direction of filling this want in a more efficacious way. The plan takes into account the mobility of automobiles, coupled with the carrying capacity of an automobile truck, thus making it possible to build and mount upon the chassis a form of armored steel body that will permit of the transfer of funds and valuables generally with the same safety that now surrounds money as it rests in the vaults of the banks.

The new car is so designed as to possess substantially all the facilities of a first-class bank, with every safeguard against even a protracted effort on the part of those who prefer not to work for what they get. The windows, doors and other points of attack are protected by electric burglar alarms; the walls and roof are built of steel and the construction throughout is fireproof. It is anticipated that this new form of traveling bank will enlarge the field of bankers' operations, making it possible to deliver pay rolls under the most conservative conditions and to collect and transfer valuables, covering considerable distances, and doing all the work at a lower cost than that which is now suffered, counting, of course, the men who must be placed to guard those who are in charge of this character of undertaking.

The interior of the car has a banking room, including a large steel safe, the door of which is equipped with a heavy bolt-work system, with a Yale bank combination lock capable of 100,000,000 changes. A desk, or counter, extends for the full width of the car under the cashier's window. To the right and left underneath the desk is arranged a series of compartments which can be used for the storage of books and other articles necessary in the transaction of the business to which the car is devoted. The walls and floors are finished with polished hardwood. An electric lighting system is used; storage batteries provide the electric energy; the windows are fitted with bevel plate glass, and the doors are equipped with special duplicate key latch locks with alarm bells attached operated electrically from the batteries.

The driver occupies the customary position at the front, there being a separating wall between the driver's position and the bank proper, but, as the illustrations show, the driver is protected from the dangers of inclement weather by means of wind shields and side panels, so that while he is not expected to do more than drive the car, he is afforded sufficient protection to render his lot reasonably comfortable.

There are three distinct models of this car, each being designed for a particular service, and they range in price from $4,500 to $6,000. The motor car bank idea was taken up abroad some time ago, and it was found to be a profitable equipment, broadening the activities of the banks and adding very materially to the safety of operations at the same time. There is no reason why this idea should not thrive in the American money centers, and the Bellamore Armored Car & Equipment Company, of 286 Fifth avenue, New York, is making preparation to enter this business in a substantial way, and it has excellent promise of support from important banks.

Electric Refining of Steel for Automobile Work

In the electric furnace the tonnage per expenditure of electric energy is a matter that is receiving much attention, and it is more than likely that the maximum expenditure is not far from one ton of steel (2,240 pounds) per 1,000 kilowatts of electric energy, starting with the cold charge. This figure is reduced considerably under the best conditions, it being reasonable to expect an output of one ton of steel from the expenditure of 500 kilowatts of electric energy, referring to mild steel for the lower rate of energy consumption. In electric refining work, the consumption is considerably less than this figure, it being the practice in this refining work to melt down the charge in open hearths and then apply to the electric furnace to do the refining work. Much headway is being made in this field, and, as one of the activities that is bringing good results for the automobile, mention will be made of permanent magnet steel; electrically refined magnet steel is now looked upon as most efficacious for the purpose.

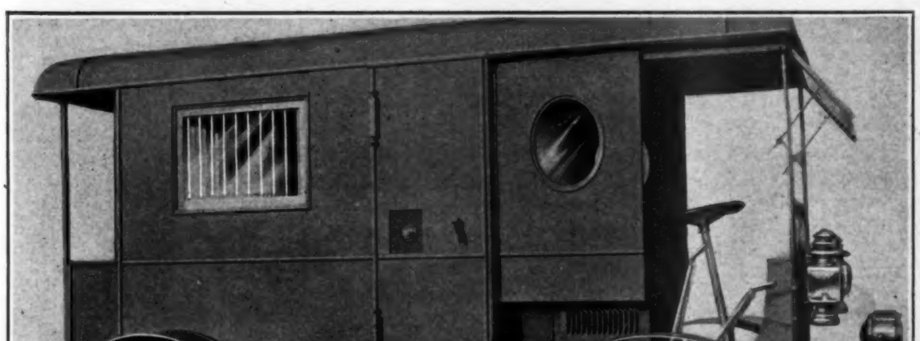


Fig. 1—Side view of a steel bank car, showing the driver's position, with wind shield, entrance to the bank and a combination lock for the door

Fig. 2—Rear end view of a steel bank car, showing the cashier's window

Savannah Automobile Club

NEAR APPROACH OF THE GRAND PRIX DRAWS ATTENTION TO ONE OF THE SOUTH'S MOST ACTIVE MOTORING ORGANIZATIONS

J. Jones F. C. Battey R. M Hull W. B. Stillwell D. J. Rosenheim

Vernon View, Where Club Will Build

A. W. Solomon F. M Oliver S. E. Theus H. Granger T. E. Youmans

SAVANNAH, GA., Oct. 24—In the vortex of public interest at this time is the Savannah Automobile Club, because of its success in gaining the privilege of staging the second Grand Prize race for the international trophy of the Automobile Club of America. The club conducted the first race for the trophy, which was in the fall of 1908. It achieved notable success in its first effort. The race was run off without a hitch or accident to any spectator, and furnished a magnificent and spectacular struggle.

The profits derived from the race were enormous, but the funds were expended in civic advancement for Savannah rather than for the use of the club itself. As a matter of fact the club spent all it took in in advertising the city and its tributary territory in Georgia.

There was no renewal of the race in 1909, and this year the opportunity to stage the event close to New York caused the Automobile Club of America to sanction a race for the cup on the Long Island Motor Parkway. Owing to a storm of protest

after the Vanderbilt Cup race the Long Island contest was abandoned, and at the instant when it appeared as if there might be no Grand Prize Race this year the Savannah Automobile Club sent a delegation of citizens to New York to make application to hold the race. This delegation presented its case so clearly and forcibly to the Contest Board of the Automobile Club of America that the race was transferred to Savannah.

Amid much rejoicing the news was received throughout the South, and before the delegation had reached home from New York with a sanction to conduct the race on November 12 work had commenced to repair the surface of the course to be used. The delegation was armed with authority from the Governor to promise military protection of the course to be used, and this promise had as much to do with the granting of the sanction to the club as any one factor.

The running of the Grand Prix in 1908 brought much credit to the club for its superb work in arranging the preliminary details and in administering the contest itself. It proved to be worthy of respect, and its performance on that occasion is the best evidence of its ability to conduct the coming race satisfactorily. The problem that confronts the club this fall is much more complex than the other, for the field in the big race will be considerably larger and the light car races for the Savannah Challenge Cup and the Tiedeman Trophy will undoubtedly attract big entry lists. Then again, the interest in contests of automobiles is much more intense this year than ever before, and vastly larger crowds will attend.

These will furnish the ground work of a fine puzzle, for the accommodations of the city are necessarily limited; its transportation facilities will be taxed to the limit and beyond; and every available space for housing and feeding the visitors will be subjected to a straining demand. But the club, city and State are determined to make the event a success and earnest efforts to apply a definite system are being exerted at present, with the result that it is promised that nobody shall suffer.

The successful administration of the 1908 Grand Prix race is not all that the Savannah Automobile Club has accomplished in a sporting way. It has projected and promoted a number of road runs, endurance tests and reliability tours. The first of these was given in 1909, when the club projected a run to Augusta. Road conditions at that time were lamentable, and the way to Augusta was exceedingly difficult to traverse.

To-day the difference in the condition of the roads is remarkable. The undertaking that required almost the life of the participants now is a pleasure trip of five hours. A year ago the club promoted a run to Atlanta, 300 miles, which resulted in numerous road betterments. Last April the club conducted a run to Jacksonville, Fla. This event marked the opening of the last link in the great automobile route from New York to the Florida winter resorts.

The club also has the distinction of conducting the first "Good Roads" convention ever held in Georgia, which was attended by over 300 officials connected with the making of good roads.

To-day the Savannah Automobile Club is one of the most virile motor organizations in the land. It holds a finger on the public pulse; it exerts a very real influence on proposed legislation and the construction of automobile laws; it shows an appreciation of the rights and wishes of others and devotes a considerable effort toward charity and the general application of justice. But while it has a full part in all these activities, and while it is undoubtedly a distinct influence in a social way and, as has been outlined all through this article, is a living factor in the sport of motoring, the chief object of the Savannah Automobile Club is Savannah.

Throughout the Old South, as well as the New South, civic spirit is the most potent of municipal and sectional forces. Georgians generally partake of this spirit, and Savannah is not one whit behind the great city of Atlanta in exerting it. If the Georgia metropolis can afford to dedicate an expensive speedway so that the name of Atlanta shall shine in the public prints and the public eye, Savannah can afford to spend the price of many a bale of cotton, many a cargo of lumber and many a carload of peaches to attract the same character of publicity.

And that is what Savannah is doing in staging the Grand Prix. It is a costly undertaking. The immediate results from it will be unappreciable. It is a big gamble, for in case of mishap there will be much criticism, and that is the last thing desired.

With all the foregoing in view the Savannah Automobile Club, aided by city, county and State authorities, has steadily gone about perfecting its plans for the big race. The course used in 1908 has been metamorphosed. Two big excrescences have been cut off and a third has been sharply modified.

Its length has been cut down to 18.5 miles, and through the lopping off of the extraneous part of the route the straightaways have been materially increased. One of these is fully eight miles long, allowing the racing cars to open wide and shoot along at their utmost speed.

Nobody in Savannah looks for anything but complete success.

The club is planning to build a home at Vernon View, a resort situated a few miles from Savannah. While a start on this project is still to be made, the intention to do so within a year is thoroughly crystallized. The club roster contains the names of many of the best and most influential citizens of Savannah. It includes the representatives of many of the proudest Georgia families, public officials and the best of the element that has come to Savannah from other sections.

Coming Events

CALENDAR OF FUTURE HAPPENINGS IN THE AUTOMOBILE WORLD THAT WILL HELP THE READER KEEP HIS DATES STRAIGHT—SHOWS, RACES, HILL-CLIMBS, ETC.

Nov. 19-26.......Oakland, Cal., Idora Park Snow, Under Management of Oakland Automobile Dealers' Association.

Dec. 1...........Chicago, Ill., First Annual Aeronautical Exhibition in the Coliseum.

Dec. 31-Jan. 7, '11.New York City, Grand Central Palace, Eleventh Annual International Automobile Show.

Jan. 7-14, 1911...New York City, Madison Square Garden, Eleventh Annual Show, Pleasure Car Division, Association of Licensed Manufacturers.

Jan. 14-28, 1911..Philadelphia, Annual Show, Philadelphia Licensed Automobile Dealers' Association, Third Regiment Armory.

Jan. 15-21, 1911..Detroit, Wayne Gardens, Detroit Automobile Dealers' Association.

Jan. 16-21, 1911...New York City, Madison Square Garden, Eleventh Annual Show, Commercial Division, A. L. A. M.

Jan. 28-Feb. 4, '11.Chicago Coliseum, Tenth Annual National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Pleasure Cars and Accessories, Exclusively.

Feb. 6-Feb. 11, '11.Chicago Coliseum, Tenth National Automobile Show Under the Auspices of the National Association of Automobile Manufacturers, Inc., Commercial Vehicles, Pleasure Cars, Motorcycles and Accessories.

Mch. 4-11, 1911...Boston, Mechanics' Building, Ninth Annual Show, Licensed Automobile Dealers' Association.

Mch. 25-Apr. 8.....Pittsburg, Annual Show, First week, pleasure cars; second week, commercial trucks. Automobile Dealers' Association of Pittsburg, Inc.

Races, Hill-Climbs, Etc.

Nov. 3-5..........Atlanta, Ga., Speedway Meet, Atlanta A. A.

Nov. 5-6..........New Orleans, La., Track Meet.

Nov. 5-7..........Los Angeles-Phœnix Road Race, Maricopa Automobile Club.

Nov. 7-11.........Five-day Reliability Run of Chicago Motor Club, 200 Miles a Day.

Nov. 10-12-13.....San Antonio, Tex., Track Meet.

Nov. 11-12........Savannah, Ga., Road Race, Savannah Automobile Club, and Grand Prix, Automobile Club of America.

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ECONOMY in the use of fuel, such as automobile gasoline, while it is the problem for the automobilist in Continental Europe for the most part, has its echo in the United States, owing to the gradual increase in the gasoline quotations and the relatively slow advance in the direction of the use of benzol, alcohol and other synthetic liquid fuels. In the meantime, very little attention seems to be paid to the questions that will lead to the more complete combustion of automobile gasoline; there seems to be no notice taken of the fact that when a pound of hydrogen is wasted it is like throwing away 62,100 heat units, and when the fuel is burned to carbonic oxide but 4,476 heat units are turned to good account, leaving all the way from 18,000 to 50,000 heat units per pound as a valuable residuum, turned to no better account than to perfume the surrounding atmosphere to the disgust of the inhabitants. Every time the guardians of the peace are "sicked" onto automobiles on account of smoke, and the pungency of the odor that emanates from the exhaust orifice of a muffler, it is a sure sign that valuable fuel is being wasted and that the carbureter and the ignition system are asleep at the switch. When the fuel is burned to complete combustion, producing carbonic acid and water, the odor is burned, too, and the legal luminary with two rows of brass buttons, and the majesty of the law in the form of a locust stick is put out of a job. Under the circumstances the officer who is directed to enforce the law, instead of getting after malefactors is really preaching economy, and there is so much good sense in his form of preaching that his presence should be encouraged, and the automobilist who is so lacking in his sense of the fitness of things that he is willing to throw away 75 per cent. of his fuel would look better paying a fine for violating the smoke ordinance than he does when he deliberately and foolishly makes a heavy inroad on the available fuel supply.

* * *

ACCORDING to the information gathered by the Forest Service of the United States Department of Agriculture, bearing upon the growth and value of hickory, considering the excellence of the service rendered by this wood in the wheels of automobiles, there is every prospect of an ultimate shortage in the supply, unless an effort is made to prevent its waste, with something of a concerted movement, besides, leading up to hickory forestry as a commercial undertaking. Statistics are responsible for the statement that it takes substantially 50 years to grow second-growth shag-bark hickory to a diameter of approximately six inches, measuring at a point breast high on the butt of the tree. Even assuming that a four-inch butt would be satisfactory for wheel-work wood, it remains to consider that thirty years will elapse in the growth of the tree to this diameter. It will be a great misfortune if the hickory supply is drawn upon at so rapid a rate that a famine will result, and it will be something of a question as to just what material can be used efficaciously in the interim of 30 years or more, pending the growth of a new supply, assuming that the present available supply is exhausted before an effort is made to relieve the situation. The makers of automobiles should encourage the Forestry Service.

* * *

DOCTORS are good customers of the automobile, and many of them are numbered in the honor roll of the pioneers who put up with the vagaries of the earlier efforts of the makers at a time when it was a large question as to whether or not a man would ever get back without walking, if he started out in a car. Some of these doctors made automobiles of their own that were eminently satisfactory, and were the information they possess available to the designers of cars it doubtless would redound to the good of the industry. Here and there a doctor or two were wont to interject a series of ideals, and a few impossibles, failing which, they went away dissatisfied, and as a means for advertising the good that resides in automobiles they must be regarded as a lasting failure. There still remain a large number of medical practitioners who for one reason or another stick to the horse, but they are rapidly reaching the conclusion that a doctor can do more work and can better look after his patients if he takes less time getting to them. It stands to reason that a physician, if he is capable, will be the most valuable to his patient if the time interval between the call and the response is cut down to a point where it would be were the patient to live next-door. As a suggestion of a physician's car, THE AUTOMOBILE offers something this week, but it should be remembered that a comfortable body is entirely out of place on a running gear that is likely to give trouble on the road. A good running gear must accompany a good body to be entirely satisfactory in this service.

The Dealer and the Daily

DISCUSSING THE ADVERTISING PROBLEM WHICH CONFRONTS THE DEALER IN AUTOMOBILES; PROPER USE OF THE DAILY PAPER RECOMMENDED

GOOD advertising copy often draws the line between the success or failure of a business. How to write an advertisement sounds like "how to get rich quick." Some well-known principles govern in each case. Dealers who have made a success, hold views on this subject, as here briefly stated:

Don't buy space and write copy to fill it; write the advertisement and then buy the space for it.

Don't buy space in all the papers all the time. Write the advertising copy for a certain class of buyers and then select the papers reaching this class.

Don't write an advertisement for a standard financial paper reaching bankers, brokers, and financial interests, and insert it in the sporting edition of a paper making a specialty of sporting news.

Don't try to reach any class by circular. If the man's name is known, write him a letter. Where the name is not known there is only one other method that will reach all the possible purchasers in a given territory at a minimum expense; that way is through the daily newspapers.

The Best Rule for Using the Daily Newspapers

First: Take enough space to be noticed.

Second: Take that space often enough to keep the business before the people.

Third: Take up one point at a time and tell people why that particular point makes a car or an accessory the best for them.

Fourth: With an unanswerable argument, tell it straight out from the shoulder.

Fifth: Don't mince words.

Sixth: Don't apologize.

Seventh: Just carry the same natural conviction that tells in a face-to-face talk.

Eighth: Don't talk to the audience in bulk; just talk as if to one man.

Ninth: There is nothing that people like better than to listen to the man who knows he's right.

Tenth: The straight-out-from-the-shoulder right talk to one man makes people go clean down into their pockets and pull the money out.

Just Say It So That It Will Stay Said

The right story doesn't have to be clever English; it needn't necessarily be great literature. Let it be crude, raw, and unpolished; nevertheless, when a man hears of something in which he is interested—something he wants or needs, or maybe will want or need in the future—show him where he can get the best goods that he can get anywhere, and you're going to get his business.

Advertising is the making of a FAVORABLE IMPRESSION on a POSSIBLE BUYER.

Anything that makes an unfavorable impression, or no impression at all, on a possible purchaser, is waste, or worse.

And anything that makes any kind of an impression on non-buyers, those who cannot and will not influence purchasers of the things advertised, is pure loss.

Advertise to make that favorable impression on that possible customer—nothing else.

[Copy for the Financial Newspaper.]

Cut of Town Car.

A Conservative Automobile for the Conservative Buyer Ripened by Broad Experience.

With Just the Right Amount of Power for a Town Car, Flexibility is Pronounced.

The Wheelbase Is One Hundred Inches Exactly, Making the Turning Radius Right.

The Control of the Car Is Simple and Reliable, There Is Absolutely No Noise.

Weight Is Adjusted to Hold the Car to the Pavement, the Center of Gravity Is Calculated.

The Tire Equipment Is Economical and Satisfactory. The Body Is Made of Aluminum.

In Style and Durability of Finish It Is the Product of the Craftsman. The Comfort of the Owner Is Studied.

The Advantages Are Positive: An Open Car for Fine Weather; Closed When the Weather Conditions Are Inclement, and Equipped for Day or Night Service with the Best Lighting—Electric. The Best Ignition—Magneto, and the Best of Everything. An Automobile to Transfer the Banker to His Business in the Morning, the Banker's Wife on Her Duty Calls in the Afternoon, and the Banker and His Wife to the Opera in the Evening.

The Price is Low for the Quality at $5,000.

[Copy for Sporting Newspaper]

Cut of Roadster.

NET RESULT OF ALL THE RACING EVER DONE.

A POWERFUL ROADSTER.

Equipped with a 60-horsepower, 6-cylinder Motor Along Racing Lines, with Endurance Added, in a Chassis That Weighs Barely 2,000 Pounds, Making 3 Horsepower per Hundredweight the Only Limit to Speed Is That as Dictated by Prudence.

With a 4-speed Selective Type of Transmission Gear, and a Straight Line Drive, a Quick Get-away and Enormous Hill Climbing Ability, Puts the Owner in a Position to Say Good-bye to Dust.

It Is a Noiseless Machine, Made so by Duplicating Accuracy in the Best Equipped Plant That Money Can Buy, And the Use of Chrome Nickel Steel in Every Part of Any Responsibility Assures a Continuance of the Same Sweet-running Qualities That Come with the Car When It Leaves the Shop.

The New Torpedo Body Built to Cut the Wind, with a Smooth Exterior, and an Inside Locker for the Spare Tire, Is Made of the Latest Aluminum Alloy, Which Is Stronger than Steel, Bringing the Weight of the Whole Body down to 90 Pounds.

With a Long Wheel-base, a Low Center of Gravity, Precision of Fit of the Parts, and Delicacy of Control, There Is Nothing More to be Desired But Smartness and Flexibility, Which Are Natural Accompaniments of a Car of These Pretensions.

The Price Is $6,000—It Includes Everything.

Trucks Run 212 Miles

LONG ROUTE TRAVELED BY CARS IN CHICAGO-MILWAUKEE EVENT, THROUGHOUT WHICH ICY WIND SCATTERED CONFETTI AND DISPELLED COMFORT

CHICAGO, Oct. 31—Manufacturers of commercial motor cars had their inning in the West last week when a motor truck run to Milwaukee and return was held with the Chicago *American* in the promoting rôle, assisted by the Chicago Automobile Club and the Milwaukee Automobile Club. Originally it had been planned to make the competition the same as that which has prevailed in other affairs of this sort, but wind and weather prevented this and converted the test into an out-and-out reliability run with the economical features eliminated. The wind played such pranks with the confetti that many of the contestants lost the road at different points along the course so that the officials of the contest declared it would be unfair to figure the gasoline and oil consumption when the distances varied to such an extent. Therefore the awards were made on a road and technical examination basis.

SUMMARY OF CHICAGO TRUCK RUN

Car No.	Car	Driver	Car Wt.	Gross Wt	No. Cyls.	Bore	Stroke	Road Pen 1st Day	Road Pen 2nd Day	Tech. Ex.	Total
	Division 1D, 500 Pounds and Under										
17	Brush	Taylor	1360	1896	1	4	5	0	0	0	0
6	Sears	Woodrich	1150	1660	2	4½	4	0	3	0	3
5	Ranger	Pinkerton		4020	2	5¼	4	159	withdrawn		
	Division 2D, 501 to 1000 Pounds										
2	Cino	Wight	2980		4	4¾	5	0	0	0	1
15	Sampson	Johnston	2470	3500		4½	4	0	0	5	5
4	Buick	Easterday	2690		2	4½	5	0	0	5	5
3	Buick	Kunze	2760	3770	2	4½	5	3	0	2	5
11	International	Peterson	2270		2	5	5	0	0	7	7
1	Overland	McGlenn	2360	3175				0	0	11	11
12	International	Sadilck	2260		2	5	5	5	17	8	30
10	Economy	Jenkins	2350	3480	2	5	4	16	15	35	66
8	Hart-Kraft	Merillat	2520	3530	2			0	3	w'hdr'n	
9	C. P. T.	Hayes	2390	3240	2	5	4	withdrawn			
14	Sears	Kropp	1330	1830	2	4¼	4	withdrawn			
	Division 3D, 1001 to 2000 Pounds										
19	Chic. Mot. Wagon	Beckley	2500	3890		4¾	5	3	4	3	10
37	Rapid	Carey	3670	5670	2	5	5½	0	0	11	11
16	Overland	Ditsler	2895	4900				11	0	1	12
20	Utility	Gardiene	3740	5850		4½	5	15	0	1	16
29	Randolph	Bensley						6	0	25	31
28	Randolph	Kreet	3960	6180	2			33	0	0	33
22	Marquette	Beck	2750		2	5	4	13	23	0	36
23	Randolph	Alberty	3750	5690				14	Withdrawn		
27	Chic. Com'l. Car	Fleiq	2780	4940	2	5¼	4	77	disqualified		
25	Monitor	Manley	2820	4000	2	5	4¾	44	134	0	178
26	Ranger	Dalton	2400		2	4¼	4	Withdrawn			
	Division 4D, 2001 to 3000 Pounds										
31	Rapid	Anson	4010	8010	2	5½	5	0	0	19	19
30	Rapid	Schmidt	4415	7430	2	5½	5	4	3	14	21
34	U. S. Motor	Crego	3630					0	0	31	31
35	Buffalo	Morrall	4330	7460	4			6	183	0	189
33	U. S. Motor	Schumard	3590			5¼	4½	0	Withdrawn		
32	Harder	Phillips	4310	7310		4¼	4¾	109	Withdrawn		
	Division 5D, 3001 to 4000 Pounds										
38	Grabowsky	Kallmeyer	4340	8310	2	5½	5	0	0	1	1
39	Mais	Mais	5520	9900	4	3¾	5¼	0	0	14	14
40	Kelly	Edwards	5780	10010	4	4⅜	5 5/16	31	2	0	33
41	LeMoon	LeMoon	4240	8480	4			0	77	0	77
	Division 6D, 4001 to 6000 Pounds										
51	Gramm	Haines	7000	13200	4	5	5	0	0	0	0
44	Rapid	Robertson	9315	15345	4	4¾	5½	3	0	0	3
45	KisselKar	Morse	6770	12280	4	4¼	4¾	8	0	7	15
52	Alco	O'Mara	7360	13740	4	3 15/16	4¾	13	2	0	15
47	Knox	Crane	7130	13450	4	5	4¾	11	0	8	19
50	Kelly	Bennett	5800	11980	4	4⅜	5¼	21	0	0	21
48	Herman	Herman	7140	13160	4	5	6	12	3	w'hd'n	
49	Kelly	Moffitt	6240	12500	4	4⅜	5½	12	Withdrawn		
	Division 7D, 6001 to 10,000 Pounds										
56	Sampson	Lee	10000	19080	4	5	5½	20	3	1	24
55	Reliance	Blohm	8105	15105	3	5½	5	0	41	0	41
54	Reliance	Post	9815	19815	4	5	5½	38	33	0	71
53	Reliance							Withdrawn			

Two of the fifty-one starters went through the test with perfect scores in both departments. One came in Class 1D for cars of 500 pounds and under capacity—the Brush. The other perfect score car was the Gramm, which won the 4,001 to 6,000-pound division. Thirteen of the contesting cars made perfect road scores as follows: No. 17 Brush, No. 6 Sears, No. 6 Cino, No. 15 Alden Sampson, No. 4 Buick, No. 11 International, No. 1 Overland, No. 37 Rapid, No. 31 Rapid, No. 34 U. S. Motor, No. 38 Grabowsky, No. 39 Mais and No. 51 Gramm. Surviving the technical examination with clean records were the No. 17 Brush, No. 6 Sears, No. 40 Kelly, No. 51 Gramm, No. 44 Rapid, No. 52 Alco, No. 50 Kelly, No. 55 Reliance and No. 54 Reliance.

Among the otherwise penalized entries which passed the technical examination unscathed were Sears, No. 6; Randolph, No. 28; Marquette, No. 22; Buffalo, No. 35; Kelly, No. 40; LeMoon, No. 41; Gramm, No. 51; Rapid, No. 44; Alco, No. 52; Kelly, No. 50; Reliance, No. 55, and Reliance, No. 54.

Good Automobile Driving

By J. B. Bartholomew, President of the Bartholomew Company

BEFORE leaving the garage the matter of gas supply, filled and well-trimmed lamps, water in the radiator, and lubrication are all looked into and known to be in good condition.

The tool kit is intact, the tires are examined to see that no tacks, nails, pieces of wire or other undesirable materials are attached thereto; the extra tire is in position, an inner tube is aboard to meet the case of tire trouble, and the tire pump is in good working condition and in place; the storage battery is properly charged, the car has been properly cleaned and polished, and any slight adjustments to machinery or brakes have been made, loose wire connections and loose bolts and nuts have been taken care of.

It is bad practice to sit in a car and allow the motor to run for an indefinite period. Stop the motor and start it when ready to go, thereby saving the gasoline and oil, besides unnecessary wear and tear on the motor.

All driving should be done at a speed with respect to road conditions and the speed ordinances and laws, and a good driver will never exceed the speed limit unless he is requested or instructed to do so, and then only on road conditions clear of other rigs, people or obstructions. The driver should watch the road and slow up for bumps and horses. If horses show skittishness, stop. At all times in passing horses the motor should be throttled down and the car coasting as nearly as possible.

Mufflers should not be cut out in places where it will excite the displeasure and criticism of other people.

Drive to miss all of the sticks, stones, bricks and other obstructions that are liable to damage the tires. Driving in street car tracks is bad practice, as fine particles of steel are apt to injure the tires.

Rubbish raked up in piles from yards should be avoided—it is apt to contain tacks.

In passing other rigs, observe the rules of the road. Never cut in close ahead of another rig. If you have a speedy car others will know it. If you have an exceptional hill climber, don't be afraid to give the other fellow a chance, and always remember that the driver who drives the car to please the customers, rather than to satisfy the crazy notions of his own, is the one that most people want to retain at the highest salary.

Final Report on Boston Truck Run

BOSTON, Oct. 31—The detailed technical report of the recent Boston *American* truck run has been issued. The report shows the cost of transporting a ton of freight one mile, total cost and its items and details. The report is as follows:

MANUFACTURERS' DIVISION

No. Name	Weight Carried	Comput. Weight	Gals. G's'line	Pints Cyl.Oil	Total Cost	Cost per TonMile
Class A—1000 Pounds and Less						
11. Warren, Detroit,...	1320	1000	9	1½	$1.53	.0248
47. I. H. C..............	1000	1000	11	9	2.32	.0386
3. Hart Kraft	1040	1000	13½	8¾	2.71	.0450
19.*Metz	460	500	9½	2	1.65	.0548
18.*Metz	460	500	14	7	2.68	.0892
44.*Reliance	1120	1000	12½	8	2.50	.0416
Class B—1001 to 3000 Pounds						
13. Franklin	3060	2000	4⅝	1¼	.82	.0068
4. Atterbury	3260	3000	13½	2½	2.32	.0128
23. Victor	3060	3000	16	5	2.47	.0158
21. Wilcox	3135	3000	16¼	8	3.10	.0172
8. Rapid	2200	2000	10½	7½	2.15	.0179
2. Rapid	2160	2000	13	11	2.77	.0230
9. McIntyre	2120	2000	15	9½	2.99	.0249
Class C—3001 to 5999 Pounds						
34. Frayer-Miller	4320	4000	22½	13	4.41	.0184
29. Garford	4310	4000	29½	14	5.60	.0233
28. Garford	4160	5000	34¼	15	6.42	.0107
Class D—6000 to 8000 Pounds						
32. Frayer-Miller	6310	6000	18½	5½	3.30	.0091
33. Frayer-Miller	5115	6000	20¾	5	3.63	.0100
35. Johnson	6140	6000	22	10	4.15	.0115
30. Alco	6320	6000	23¾	12	4.55	.0126
6. Knox	8245	8000	39	6½	6.65	.0138
Class E—10,000 Pounds						
26. Morgan	10,220	10,000	34¼	15	6.42	.0107
24. Sampson	10,560	10,000	40	8	6.90	.1150
PRIVATE OWNERS—Class B						
41. Autocar	3240	3000	9¾	5	1.87	.0103
1. Autocar	3780	3000	11¾	8	2.38	.0132
17. Rapid	2220	2000	10	8	2.10	.0175
40. Gramme	4320	3000	20¼	5	3.55	.0196
Class C						
43. Frayer-Miller	5060	5000	21½	7½	3.91	.0130
Class E						
49. Mack	6160	10,000	20	21	4.51	†

*Road Penalty. 44—164 points. 19—38 points. 18—10 points. All others clean. †Did not carry full load.
Gasoline figured at a uniform rate of 16 cents per gallon.
Cylinder oil figured at a uniform rate of 50 cents per gallon.
Number of miles covered—One hundred and twenty.

A. M. C. M. E. A. Show

List of Exhibitors Swelled to 42; Will Open New Year's Eve

METROPOLITAN devotees of the motor will have ample chances to examine everything that pertains to the automobile at the trio of shows that will be held in New York in January. The A. L. A. M. exposition which will take place in two sections, each a week long, the first devoted to pleasure cars and the second to commercial vehicles or freight carriers, will be of much wider scope and detail than ever before. An unprecedentedly large collection of licensed cars will be shown amid all the splendor of Madison Square Garden in gala attire.

The independent show, which will be held at the Grand Central Palace from December 31 to January 7, promises to be a large and interesting exhibition. Mr. Longendyke, secretary of the A. M. C. M. E. A., announced late Wednesday afternoon that the application for sanction of the show, which had been made to the National Association of Automobile Manufacturers on October 18, had been refused. In speaking of the matter Mr. Longendyke said:

"We applied to the N. A. A. M. for sanction in order to outline our status as far as that organization is concerned. We did not feel that our application would be granted, but we determined to apply anyway. The holding of the show was never dependent upon the sanctioning of the event and it will be held despite the fact that sanction has been withheld.

"Our list of signed-up exhibitors to date includes forty-two distinct companies. I am confident that the list will be extended to at least 70 names. The list is as follows:

Abbott Motor Co.,	Detroit, Mich.
American Motor Truck Co., of Mich.,	Detroit, Mich.
American Motor Truck Co.,	Lockport, N. Y.
Atterbury Motor Car Co.,	Buffalo, N. Y.
Babcock Company, H. H.	Watertown, N. Y.
Bergdoll Motor Car Co., L. J.,	Philadelphia, Pa.
Carhartt Auto Corporation,	Detroit, Mich.
Car Makers' Selling Co.,	Chicago, Ill.
Chase Motor Truck Co.,	Syracuse, N. Y.
Chicago Pneumatic Tool Co.,	Chicago, Ill.
Cortland Motor Wagon Co.,	Cortland, N. Y.
Clarke-Carter Auto. Co.,	Jackson, Mich.
Columbus Buggy Co.,	Columbus, Ohio.
Demot Car Sales Co.,	Detroit, Mich.
F. A. L. Car Sales Co.,	Chicago, Ill.
Findlay Motor Co.,	Findlay, Ohio.
Gramm Motor Car Co.,	Bowling Green, Ohio.
Houpt Mfg. Co., Harry S.,	New York, N. Y.
Imperial Auto Co.,	Jackson, Mich.
Johnson Service Co. (pleasure),	Milwaukee, Wis.
Johnson Service Co. (commercial),	Milwaukee, Wis.
Kelly Motor Truck Co.,	Springfield, Ohio.
Krit Motor Car Co.,	Detroit, Mich.
Lion Motor Car Co.,	Adrian, Mich.
H. Moeller & Co.,	New Haven, Conn.
Martin Carriage Works,	York, Pa.
Michigan Buggy Co.,	Kalamazoo, Mich.
Metz Company, C. H.,	Waltham, Mass.
Otto, Albert T.,	New York, N. Y.
Owosso Motor Co.,	Owosso, Mich.
Parry Auto Co.,	Indianapolis, Ind.
Paterson, W. A., Co.,	Flint, Mich.
Penn-Unit Car Co.,	Allentown, Pa.
Penn Motor Car Co.,	East Liberty, Pa.
Quimby & Co., J. M.,	Newark, N. J.
Schacht Mfg. Co.,	Cincinnati, Ohio.
Scioto Auto Car Co.,	Chillicothe, Ohio.
Seitz Motor Car Co.,	Detroit, Mich.
Staver Carriage Co.,	Chicago, Ill.
Spencer, Llaana, Briner Co. (Petrel Car),	New York, N. Y.
Warren Motor Car Co.,	Detroit, Mich.
Whiting Motor Co.,	Flint, Mich."

The Importers' Salon, at which the foreign cars will be shown, will be held at the Hotel Astor from January 2 to 7. The floor space of 11,000 square feet has all been contracted for except about 1,000 feet.

Al Livingstone, Auto Racer, Killed

Al Livingstone, one of the leading racing drivers in the employ of the National Motor Vehicle Corporation, was killed as the result of an accident on the Atlanta Speedway, Tuesday. Livingstone was giving his car a final try-out in preparing for the races now in progress, and was doing some fast work when his right rear tire blew out, and the driver was thrown thirty feet into the air, landing on his head. His skull was fractured, and he was dying when removed to a hospital. Mr. Livingstone leaves a widow.

Premier Car Finding Aeroplane Landings

With Ray McNamara at the wheel, a Premier 4-40, 1911 model, is now traversing the Western part of the continent, picking out locations for aeroplane landings from coast to coast, which may be used in transcontinental flights such as the one for which a prize of $50,000 was offered. There is nothing unusual about the trip save its purpose. The route is via Buffalo and Cleveland to Chicago, thence westward by the way of Davenport, Omaha, Kansas City, Trinidad, Santa Fé to Los Angeles.

Premier 4-40 Pathfinder in Continental Aviation Prize. Ray McNamara at wheel.

27 Clean Truck Scores

TWO-DAY RUN CONDUCTED BY NEW YORK "AMERICAN" PROVES INTERESTING TEST OF RELIABILITY UNDER CONDITIONS LIKE THOSE OF REAL SERVICE

SUCCESSFUL in every way proved the truck run conducted by the New York *American* Friday and Saturday of last week. There were 49 starters in the various classes of the contest, of which 27 completed the scheduled course with perfect road scores. One dozen of the gasoline cars were penalized for work on the run, and of these only four reported mechanical troubles. Only two of the electrics suffered mechanically.

The chief difficulty experienced in both classes of trucks was the shortage of gasoline and current, which accounted for nine penalizations, six among the electrics and three among the gasoline cars. Two gasoline cars missed the course and were disqualified; another missed some of the controls and the final demerited car suffered magneto troubles. The other electsics to lose their clean scores were charged with being late and failure to finish the route.

The run was about 65 miles a day for the transfer divisions and from 30 to 45 miles a day for the delivery divisions. The first day's course was laid out through the streets of the city to Westchester County and the second was on Long Island, past the aviation field and return. That nearly two-thirds of the cars finished the whole course without penalization is considered remarkable by the promoters of the run, and that only six out of 49 suffered mechanical troubles is very gratifying.

Alco, No. 16, clean score in Division No. 4

The officials are still figuring out the relative expenditure of gasoline, oil and current for the various entrants, and the winners of the sweepstakes and class events will be announced in due course. The summaries of the road work are as follows:

No.	Car	First Day	Second day
	MANUFACTURERS' CARS (GASOLINE)		
	Transfer classes—Division 1, 1000 pounds and under—		
1	Chase	0	0
2	Hatfield	0	0
3	Hatfield	0	0
4	Brush	Dis., wrong route	
	Division 2, 1001 to 3000 pounds—		
5	Grabowsky	0	Dis., taking oil.
8	Victor	0	422
9	Atterbury	0	0
	Division 3, 3001 to 5000 pounds—		
10	Renault	0	0
11	Walter	Dis., wrong route	
12	Kelly	0	0
	Division 4, 5001 to 8000 pounds—		
16	Alco	0	0
19	Grabowsky	0	0
20	Knox	0	Withdrawn, burned connecting rod brasses
21	Kelly	11	Ignition; dis., taking gas
22	British-Atlas	0	20 Magneto
23	Alden-Sampson	37 adj'mt	0
	Division 5, 10,000 pounds and over—		
24	Hewitt	Dis., taking gas	
25	Morgan	0	0
26	Gaggenau	Dis., taking gas	
	DISTRIBUTING CLASSES (GASOLINE VEHICLES)		
	Division 1, 1000 pounds and under—		
28	Brush	0	0
29	Hart-Kraft	0	0
	Division 2, 1001 to 3000 pounds—		
7	Cass	0	Withdrawn, broken bearing
30	Monitor	0	0
32	Grabowsky	Dis.; missed stops	
34	Grabowsky	0	0
	MANUFACTURERS' CARS (ELECTRICS)		
	Transfer classes—Division 1, 1000 pounds and under—		
37	General Vehicle	92 Work	0
	Division 2, 1001 to 3000 pounds—		
38	General Vehicle	Dis.; taking current	
39	Lansden	Withdrawn; short circuit	
	DISTRIBUTING CLASSES		
	Division 2, 1001 to 3000 pounds—		
44	Lansden	0	0
	OWNERS' DIVISION		
	Electric distributing class—Division 1, 1000 pounds and under—		
47	General Vehicle	Dis.; taking current	
	Division 2, 1001 to 3000 pounds—		
40	Lansden	0	0
41	General Vehicle	31 Late	0
42	General Vehicle	0	0
43	General Vehicle	Dis.; taking current	
45	Lansden	0	0
46	General Vehicle	Dis.; taking current	
	Division 3, 3001 to 5000 pounds—		
48	General Vehicle	0	0
49	Chicago	Failed to finish	
	Division 4, 5001 to 8000 pounds—		
50	General Vehicle	0	0
51	General Vehicle	Dis.; taking current	
52	General Vehicle	Dis.; taking current	
53	General Vehicle	0	0
54	General Vehicle	0	0
55	Commercial	0	0
56	General Vehicle	0	0
	Division 5, 10,000 pounds and over—		
36	General Vehicle	0	0
37	General Vehicle	0	0
58	General Vehicle	0	0
	OWNERS' DIVISION (GASOLINE)		
	Distribution class—Division 2, 1001 to 3000 pounds—		
33	Autocar	0	0

Reeves Says A.L.A.M. Will Show in 1912

General Manager Reeves, of the A. L. A. M., in speaking for his association, stated Wednesday that the National Automobile Show of 1912 would be conducted at Madison Square Garden by the association. He said that he had heard some talk among the New York dealers about handling the show in 1912, but that the manufacturers had decided to hold the show themselves.

General Vehicle, No. 58, perfect in heavy electric class

Atlanta Lists Well Filled

NUMBER OF ENTRIES FOR COMING MEET PROMISES MAGNIFICENT SPORT DURING THREE DAYS, WITH BIG FEATURE AT EACH SESSION

ATLANTA, GA., Oct. 31—The Atlanta Speedway meet gets under way Nov. 3, and for three days there should be really good sport on the fast two-mile Georgia course.

When entries finally ceased, about ten minutes before the official closing time, there were 48 cars named for the three days' meet, and a brace of Fords will ask permission of all concerned to allow them to enter in the 250-mile free-for-all.

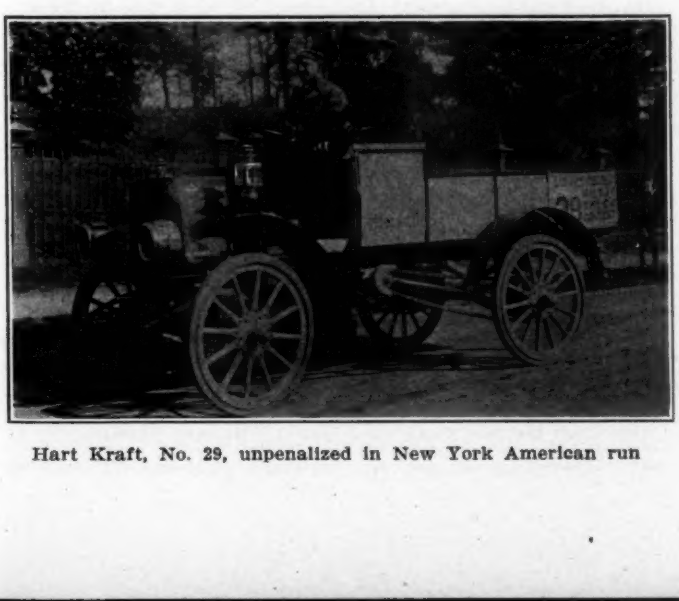
Special interest attaches, of course, to the three feature events of the meeting, one each day. The opening race will be a hundred-mile dash for the Coca-Cola trophy. This is for the 301-450 machines, and fifteen good ones are named. The list includes three Nationals, three Falcars, a brace of Pope-Hartfords, a Cole, a pair of McFarlans, two Marmons, a Halladay and a Wescott.

Nineteen cars have been named for the City of Atlanta trophy race, a contest at 200 miles for cars of 451-600 displacement. These machines are two E-M-Fs, three Pope-Hartfords, two Nationals, a Parry, a Halladay, a Stearns, three Abbott-Detroits, a Stoddard-Dayton, a Firestone-Columbus, a Simplex, and a pair of McFarlans.

In the 250-mile free-for-all more than half the cars at the meet are entered, twenty-six, to be exact, with prospects that two more machines will be allowed to break in.

Here is the list:

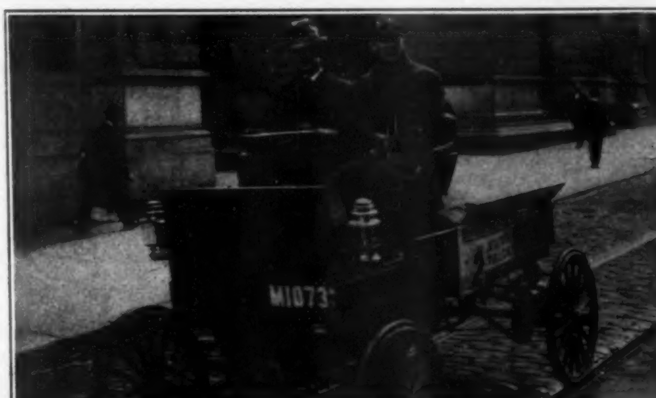
Number	Car	Driver
1	E-M-F	Cohen
2	Fiat "90"	Bragg
3	Fiat "60"	Stoddard
4	Pope-Hartford	Church
5	Lozier "4"	Mulford
6	Lozier "6"	Horan
7	National	Livingstone
8	National "6"	Aitken
9	National	Wilcox
10	National	Aitken
11	Marmon	Heinemann
12	Falcar	Geinaw
13	Simplex "90"	Church
14	Falcar	Hughes
15	Cole "30"	Endicott
16	Cole "30"	Edmunds
17	Pope-Hartford	C. Basle
18	Cole, 1911 Model	Endicott
20	Firestone-Columbus	McKinstry
21	Marmon	Harroun
22	Pope-Hartford	Disbrow
23	McFarlan	Kepler
24	McFarlan	Adams
25	Marmon	Heinemann
26	Wescott	Knight
27	Falcar	Pierce
28	Marmon	Dawson
29	Firestone-Columbus	McKinstry
30	Chalmers	Moss
31	National	Woodside
32	E-M-F	Witt
33	Parry	Phillips
34	Halladay	Harrell
35	Stearns	Rutherford
36	Simplex "50"	Beardsley
37	Abbott-Detroit	Monty Roberts
38	Abbott-Detroit	Mort Roberts
39	Abbott-Detroit	McIntyre
40	Marquette-Buick	Burman
41	Renault	
42	Stoddard-Dayton	Harding
43	Firestone-Columbus	McKinstry
44	Simplex "90"	Matson
45	Marmon	Heinemann
46	American	Wallace
47	Darracq	Kirscher
48	Knox	Kirscher
49	Benz	Kirscher



Hart Kraft, No. 29, unpenalized in New York American run

Milwaukee Club Selects Standard Bearers

MILWAUKEE, Oct. 31—The Milwaukee Automobile Club has elected officers as follows: President, Charles W. Norris; first vice-president, Oscar F. Fischedick; second vice-president, Dr. Louis Fuldner; secretary, Arthur C. Brenckle; treasurer, Lee A. Dearholt. Messrs. Brenckle and Dearholt were honored with re-election. The increase in membership since the last annual meeting has been very gratifying, and efforts will be made to still further add to the roll during the coming year.



Hatfield, No. 2, clean score in Manufacturers' Division 1

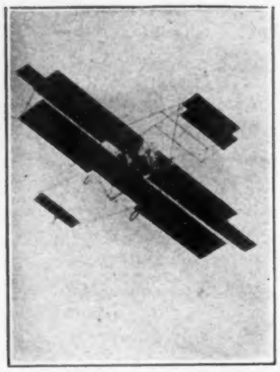
The club is in excellent financial condition and is now building a $15,000 club house near Milwaukee. This will be formally opened on New Year's eve. The third annual show will be held in February, it having been practically decided to again follow the Chicago passenger vehicle show.

Massachusetts State A. A. Elects Officers

BOSTON, MASS., Oct. 29—The annual meeting and election of officers of the Massachusetts State A. A. was held here Friday night at the Parker House. The following officers were re-elected unanimously as a tribute to their efforts during the past year in enlarging the organization: A. D. Converse, Winchendon, president; J. P. Coghlin, Worcester, vice-president; James Fortesque, Boston, secretary and treasurer. Vice-President Coghlin was made chairman of the legislation committee; W. H. Chase, chairman of the good roads committee, and A. E. Lerche, chairman of the signs committee. The association now has a membership of 4,300 and it was reported that this figure will be largely increased during the next year.

Moisant Wins for America

IN THRILLING RACE AROUND STATUE OF LIBERTY HE BEATS GRAHAME-WHITE AND DE LESSEPS IN NEWLY PURCHASED BLERIOT MONOPLANE



Hamilton's machine patterned after the Curtiss type and equipped with a Christie motor of 110 indicated horsepower. The motor was not ready and the machine seldom flew

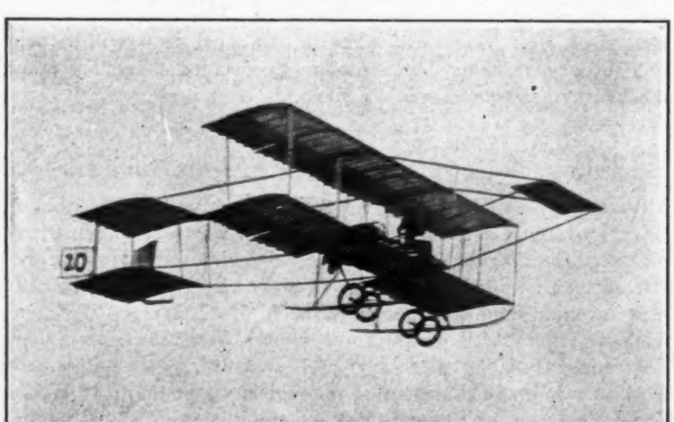
AMERICA, Britain and France divided the honors of competition in the International Aviation Meet which came to a close Monday evening after John B. Moisant in his hastily purchased 50-horsepower Blériot monoplane had won the great race from Belmont Park around the Statue of Liberty in New York harbor and return by less than one minute.

Grahame-White in a 100-horsepower Blériot apparently had the race won by his magnificent flight around the statue earlier in the afternoon and was receiving congratulations for England's triumph when Moisant was announced as a competitor. Count De Lesseps had made his trial and failed to equal the showing of the British aviator.

Moisant shot into the air with his motor buzzing like a wasp and, after reaching an elevation of nearly 3,000 feet, headed straight for the harbor across Brooklyn. In the teeth of a cold wind he flew the 16 1-2 miles a trifle over 50 miles an hour; made the turn with a short sweep and came back at the rate of well over a mile a minute. His total elapsed time was 34:38 84-100.

Grahame-White, by winning the Coupe Internationale d'Aviation, covering the 100 kilometer course in 1:01:04 3-5, in his high-powered Blériot, took away from America this trophy, which was won last year by Curtiss. Moisant was second in this event. But for an accident in which his Blériot was wrecked in the final round of the course, M. LeBlanc would have won, as he had a lead over the winner of over five minutes when he struck a telegraph pole. At the time he was making rounds of the course under three minutes and several of his circuits were considerably below that figure, establishing a new world's record mark of 2:44.32 for a single round of five kilometers.

The daily attendance at the meet was excellent and on the various days when feature events were carded the big stands, lawns and fields were thronged.



Harmon's Farman biplane operated by Grahame-White. Gnome motor. Large area. Small weight. Considerable lifting and altitude capacity. Small speed. Small ability for braving the wind. Always ready for flight in fair weather

In the inclosure of the park on Sunday afternoon and gathered nearby at various points of vantage were fully 75,000 enthusiasts, and the reception given the American winner has never been equaled so far in the history of air contests.

The story that underlies the running of this race is one of the most romantic in the archives of sport. Moisant had been formally entered for the statue flight for several weeks and had a special racing machine all ready to take part. In starting Moisant's motor went wrong and his machine was smashed against a crippled biplane. He had only a few minutes in which to get another, and the only available machine was a new one belonging to LeBlanc, who was confined to his bed in a New York hotel on account of bruises received in the International Cup trials. By telephone the terms of the sale were arranged after LeBlanc had been assured that no French aviator had a chance to beat Grahame-White's time. Just within the limit the American made his start and won.

One type of Blériot monoplane, head on. Other type has spreading tail. Gnome motor. Planes slightly curved near front edge. Slight warp. Rear control. Always ready. Medium stability in the wind. Medium weight. When built for carrying capacity has larger planes more curved

In a diminutive Wright aeroplane, Ralph Johnstone broke the world's altitude record on the final day of the Belmont Park meeting. His feat was accomplished late in the day. The machine, which has only 173 square feet of plane surface, was specially built to climb the air and in its preliminary trials under the handling of Orville Wright, it had demonstrated much facility in Pike's Peaking.

Johnstone made the first 7,000 feet of his record-breaking flight in twenty minutes, and then swung around in narrowing circles until he reached the height of 9,714 feet. Summaries:

Wednesday

Hourly distance—Latham (Antoinette), 17 laps; time 36:22 2-5.
Altitude—Hoxsey (Wright), 6.183 feet.
Cross country—Aubrun (Bleriot), 20 miles; time 28:08:75.

Thursday

Hourly distance—Latham (Antoinette), 14 laps; time 55:24.05.
Altitude—Brookins (Wright), 650 feet.

Friday

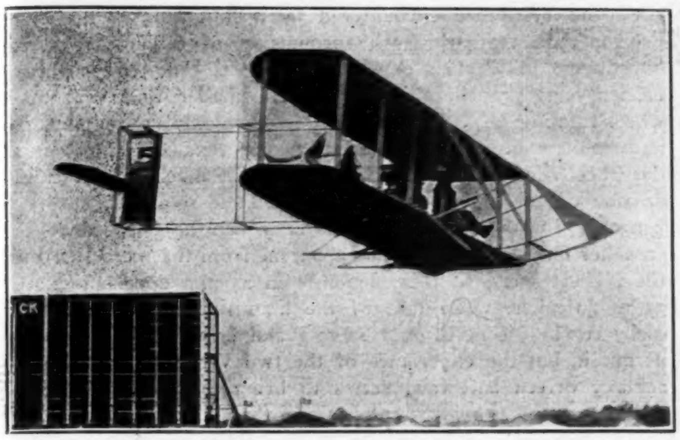
First hourly distance—Latham (Antoinette), four laps; time 14:25.
Second hourly distance—Latham (Antoinette), 12 laps, time 40:34.01.
First hourly altitude—Hoxsey (Wright), 6,705 feet.
Second hourly altitude—Parmalee (Wright), 3,636 feet.

Saturday

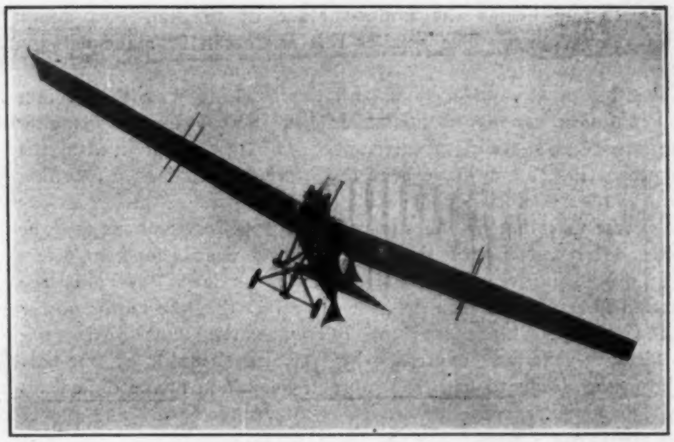
International speed race, 100 kilometers—Grahame-White (Bleriot), first; time 1:01:04:74; Moisant (Bleriot) 1:57:44:85.
First special altitude—Hoxsey (Wright), 5,146 feet.
Second altitude—Hoxsey (Wright), 4,644 feet.

Sunday

Statue of Liberty flight—Moisant (Bleriot "50"), first; time 34:38:84. Second, Grahame-White (Bleriot "100"); time 35:21:30. Third, De Lesseps (Bleriot), 41:56.25.
Hourly distance—Latham, 33 laps;
Altitude—Simon, 959 feet.
Monoplane race—Grahame-White, ten laps in 14:56:30.
Cross country (20 miles)—Radley, 20:05:60.
Aero Club distance event (two hours),—Moisant, 53 laps.
Special altitude—Johnstone, 9,714 (World's record).
Grand special speed contest (ten laps)—Grahame-White; time 14:34 2-5.



The normal Wright machine for rear control. Wright motor with direct injection of fuel. Great capacity for altitude. Always ready. Large area. Medium weight. Flies in higher wind than any other machine shown at the meet. Head resistance smaller and warp more pronounced than in earlier Wright machines.



Latham's Antoinette monoplane. Weight about 2500 pounds. Antoinette 16-cylinder V-motor, usually hard to get running well till heated. Long tubular radiator along sides of frame. Slight warp. Cannot turn sharply. Seldom if ever seen banked as much as photograph shows.

Flying for Prizes

BY MARIUS C. KRARUP—OBSERVATIONS BEARING UPON CONSTRUCTION FROM THE BELMONT PARK AVIATION MEET—MATURED AMERICAN FLYERS SHOW SUPERIOR INDEPENDENCE OF THE WEATHER

AT the Belmont Park meet, just closed, nothing which was new mechanically was successful, but refinements in design as well as minor differences due to the accidents of rule-of-thumb construction were shown to have a very pronounced influence upon the flying properties of the machines, especially on speed and stability.

Among the new features the most conspicuous were the small Wright flyers specially built to demonstrate speed and of the biplane type, the Curtiss monoplane with Curtiss motor, the Christie monoplane with two Christie motors and two propellers, both on shafts running axially through the middle of the machine, and the Hamilton biplane, built in close emulation of the Curtiss type, but equipped with a Christie motor of 110 indicated horsepower.

Among the events, the altitude flights performed by Hoxsey and Johnstone in full-sized Wright biplanes and their daring corkscrew descents under weather conditions which were sometimes very trying, indicated substantial progress, accomplished very largely, it seems, by eliminating the front elevating rudders and thereby rendering the control less sensitive and infusing more confidence in the aviator. An inspection of the machines indicated that the rear spars, and possibly the front spars as well, were more flexible than formerly, so that the machines were probably subject to a readier and more decisive control by warping of the main planes than the earlier machines in which the front elevating rudders were retained, and it seems that this is the feature through which a much improved ability to weather gusty winds of moderate strength or strong steady winds has been materialized. Their superiority over all other machines at the meet was in this respect marked. Their ability to "plane" down with the motor shut off and at dizzy angles, their course at times showing the lines and proportions of an ordinary corkscrew of steep pitch, was in itself plain evidence of three important refinements: (1) more pronounced warping, admitting of the sharp turns; (2) reduced air resistance from the non-supporting parts of the construction, brought about by the elimination of the front control and the more refined contours and dimensions of stanchions, spars and radiator, and (3) the increased confidence of the operator inspired by relieving him of attention to the too-sensitive front rudder, while yet placing his safety fairly independent of the motor power by virtue of the warp and the large area of the planes. The large and more or less flexible rear edges of the planes probably also contribute to their relative independence of the weather.

Other events of importance to the student of these forces which make or unmake flight, were the speed trials, including particuarly the flight from the aviation field to the Liberty statue and return, through which it was shown that identical machines differ greatly in speed capacity and that a machine driven by a 85-100-horsepower motor is not necessarily speedier than another machine of the same design but driven by a 40-50 horsepower motor. In the 36-mile flight around the Liberty statue only Blériot monoplanes were engaged. Grahame-White's, with a 100-horsepower motor, made the distance in about 37 minutes. DeLesseps, with a 50-horsepower motor, used about 6 minutes more, traveling at practically the same time and under the same wind conditions. Moisant, about one hour later, made the same circuit a little faster than Grahame-White, with a 50-horsepower motor and a machine so near alike to that piloted by DeLesseps that the eye could barely detect any difference, by a somewhat close comparison made at the sheds the following day. The wind, however, had changed a trifle in direction and possibly in velocity, as indicated by the position of a captive balloon floating above the statue. The difference of 6 minutes in the speed of Grahame-White and DeLesseps would correspond to about one-third greater propulsive power in the Grahame-White machine, a gain of one-sixth in speed, meaning about one-third more resistance overcome, in the case of machines of identical shape and dimensions. DeLesseps and Grahame-White are men of about the same size and weight, while Moisant is much smaller and the machine which he bought from Leblanc was no doubt adjusted to the weight of the latter, which is about the same as Moisant's. The mere difference in the loads, possibly amounting to 40 pounds, would, according to experience at previous meets, make a scarcely perceptible difference in the speed, but a different balancing of the machines might make a considerable difference, necessitating constant rudder action or a higher flying tilt in the machine least well balanced. The inspection seemed to indicate one slight difference between the machine of DeLesseps and Moisant. The angle of the planes with the main extension of the tail seemed to be 2 to 3 degrees larger in the DeLesseps machine than in the other. This angle serves the purpose of giving a certain degree of automatic fore-and-aft balance, since a rise of the wings

immediately brings the under-surface of the tail into action for rear support. The smaller this angle can be made and yet serve its purpose, the greater the sustentation of the machine must be, other things equal, and the machine with the greater sustentation can fly at a smaller tilt, thereby meeting smaller resistance and gaining greater speed. Finally, the motors of the three machines may have been in different conditions of "tuning up," and the efficiency of the propellers may be different, the slightest variation of the curves of a propeller, such as may be caused by warping of the wood, having been found to affect the propulsion very noticeably, though the laws governing the action have not yet been defined. The fact that the motor power of Grahame-White's machine overcame only one-third more resistance than was overcome by DeLesseps' motor of one-half the power seems to find its readiest explanation in the difficulties in harmonizing propeller dimensions with the speed and power of the motor. Altogether the three performances give rise to a number of mechanical considerations which all designers of speed machines must take into account, even if the slight change of wind offers a facile explanation of the apparent discrepancies.

On one of the days of the meet Hoxsey and Johnstone, whom the spectators had become used to seeing disappear through the clouds to the sunny but cold regions above and suddenly reappear in the same manner after an absence of hours, were engaged in this sport while the wind was blowing at the rate of possibly 25 miles per hour, when the velocity of the wind began to increase, reaching perhaps 60 miles per hour, as estimated by Johnstone. Under these conditions the flyers could not hold their own, but drifted with the wind, while heading it and working against it at full motor speed. They were carried away from the field a distance of about 25 miles in one hour, showing that, as against the atmosphere, they were making their usual maximum speed of 35 miles per hour, while in relation to things terrestrial they flew backwards at the rate of 25 miles per hour—an entirely new experience in aviation for the simple reason that nobody before has flown in a wind of 60 miles velocity. At last Johnstone was compelled to risk a descent, as his gasoline was running very low and a planing descent without power was out of the question in the high wind. And he succeeded in making this descent through strata of atmosphere where the wind was not only strong but gusty as well, and landed near Middle Island, whence he flew back to Belmont Park the next day. As a 60-mile wind has never been known to stop a 30-horsepower limousine, incidentally stopping its motor, although the wind resistance encountered by a limousine is no doubt greater than that which the propulsion of a Wright biplane overcomes, Johnstone's experience suggests that the propulsive efficiency of propellers is very much smaller than that of a wheel rotating on a firm road. It is commonly figured that the automobile motor delivers about 70 per cent. of its power at the wheel rim, on the high gear, and as the much simpler transmission of the biplane should deliver at least as much to the propeller shafts, the loss in efficiency can be charged to the propeller only. This would be apparent from the mere fact that the highest speed of these biplanes in a calm does not exceed 35 to 40 miles, while that of the limousine of 30-horsepower easily reaches 50 miles on a smooth and firm road, if the gears permit it, but the experience of the two Wright fliers in being actually driven backward seems to bring the interpretation of the fact nearer to reality, emphasizing that the need in aeroplane construction should be sought in the direction of a propeller which will operate with the positive action of an automobile driving wheel rather than in the direction of motors with enormous power, expensive to maintain, as well as difficult to produce within the weight limits.

The small Wright speed machines shown at the meet and of which much had been expected, turned out to be biplanes, with very small plane areas. One of them had a wing span reduced to about 22 feet, or about half of the usual Wright dimensions, and was equipped with a new V-motor with eight cylinders, figured capable of developing 60 horsepower. The motor appeared difficult to get into working order and the accident to Brookins, when the latter was preparing to enter in the speed trials, was due to four of the cylinders ceasing to function and the rest being insufficient to keep the machine in the air. Its weight was said by Wilbur Wright to be about 920 pounds with the aviator and gasoline on board, and a ground speed of more than 40 miles per hour was required for starting it. Flown by Orville Wright, it showed great speed, according to the writer's timing, at least equal to that developed by the 100-horsepower Blériot. The other speedy Wright machine was operated by Ogilvie, of the English team, weighed about 750 pounds with everything up, spanned 26 feet with a width of 3 foot 6 inches, was equipped with the ordinary Wright motor and was said by its operator to require a starting speed of 40 miles per hour in a calm. The two machines must, therefore, be intended to start at very different tilts, the curvature of their planes being very much alike, while their weights and areas differ, as stated.

Terrific Speed in Grand Prix

EARLY PRACTICE OVER COURSE DEVELOPS REMARKABLE STORIES OF FAST TIME—FIELD WILL PROBABLY INCLUDE 21 FLYERS

SAVANNAH, Oct. 31—In addition to the entry list published in The Automobile last week, the Grand Prize entries now include a Sharp-Arrow, two Pope-Hartfords, two Oldsmobiles and a Stoddard-Dayton. There is a question whether the two Lorraine-De Dietrichs mentioned in the list last week will start, but there is a probability that such will be the case.

The course has been thoroughly oiled and rolled out and will be thrown open for formal practice to-morrow. The usual crop of reports of fast time made in unofficial spins have made their appearance. One of the entered cars is said to have turned a mile in Ferguson avenue at the rate of 106 miles an hour.

The Fiat team is quartered at Doyle's on Thunderbolt road; the Benz crew and cars are at the German Club; the Loziers will be quartered at the Thunderbolt Casino; the Marmons, Marquettes, Buicks and Roebling-Planche are at Fifty-second street and White Bluff road.

Already the city is beginning to feel the influx of visitors as nearly every train and ship brings in a handful connected in one way or another with the big race. Chairman Robert Lee Morrell, of the Contest Committee of the Automobile Club of America, and a delegation from that organization has reached this city. Mr. Morrell and his party were met by a committee from the Savannah Automobile Club and escorted to the Chamber of Commerce, where they were presented to Mayor Tiedeman, who turned over to them the administration of the race.

All the drivers who have been over the course unite in predicting a new American road race record in the Grand Prize. These predictions run all the way from 68 to 75 miles an hour, with the majority selecting about 70 miles an hour as the favorite figure. On account of the three stiff turns the general opinion is that the world's mark of over 74 miles an hour will stand.

There is little likelihood of any more entries than those already mentioned. The starters will probably number about twenty-one, although twenty-seven have been nominated.

Texans Race Three Days

FINE WEATHER AND BIG CROWDS COMBINE TO ADD TO THE SUCCESS OF THE DALLAS MEET, AT WHICH GOOD SPORT IS ENJOYED

DALLAS, TEX., Oct 29—Favored with large crowds, ideal weather and a track that was in first-class shape for fast auto racing, the three-day meet held under the auspices of the Dallas Automobile Dealers' Club on the mile track at the Dallas State Fair Grounds was brought to a close to-day.

The feature event on the last day of racing was the 50-mile free-for-all Dallas Derby. Four cars faced the starter in this event, as follows: Stoddard, two Cole cars, and a Cutting. The Stoddard started out at a fast clip to cinch the race in the early running, but a foul spark plug cost it the lead in the nineteenth lap. At this stage of the race the Cutting jumped to the front with a two-lap lead and held it until the fortieth lap, when engine troubles put it out of the running.

The Stoddard proved the winner and did the 50 miles in 56:10. Summaries:

FIRST DAY

No.	Car	Driver	Time
	Stock chassis, fast mile, 300 cubic inches and less—		
1.	Cutting	Clark	1:00 4-5
2.	Moon	Wells	....
3.	Cole 30	Endicott	....
	Stock chassis, class B, 230 cubic inches and less—		
1.	Buick 10	Fred Malone	10:43 1-5
2.	Cole 30	H. Endicott	....
3.	Cole 30	B. Endicott	....
	Class D, free-for-all, five miles—		
1.	Cutting	Clark	5:27 3-5
2.	Cole 30	H. Endicott	....
3.	Cole 30	B. Endicott	....
	Stock chassis, class E, 600 to 450 cubic inches, 50 miles—		
1.	Cutting	Clark	52:38
2.	Moon	Wells	....
3.	Cole	B. Endicott	....

SECOND DAY

No.	Car	Driver	Time
	Free-for-all, handicap—		
1.	Stoddard-Dayton (scratch)	De Hymel	9:51 3-5
2.	Cutting	Clark	....
3.	Cole 30	B. Endicott	....
	Free-for-all, class D		
1.	Stoddard-Dayton	De Hymel	1:02
2.	Moon	Wells	....
3.	Cutting	Clark	....
	One hour, free-for-all, stripped chassis, class C—		
1.	Stoddard-Dayton	De Hymel	....
2.	Moon	Wells	....
3.	Cutting	Clark	....

THIRD DAY

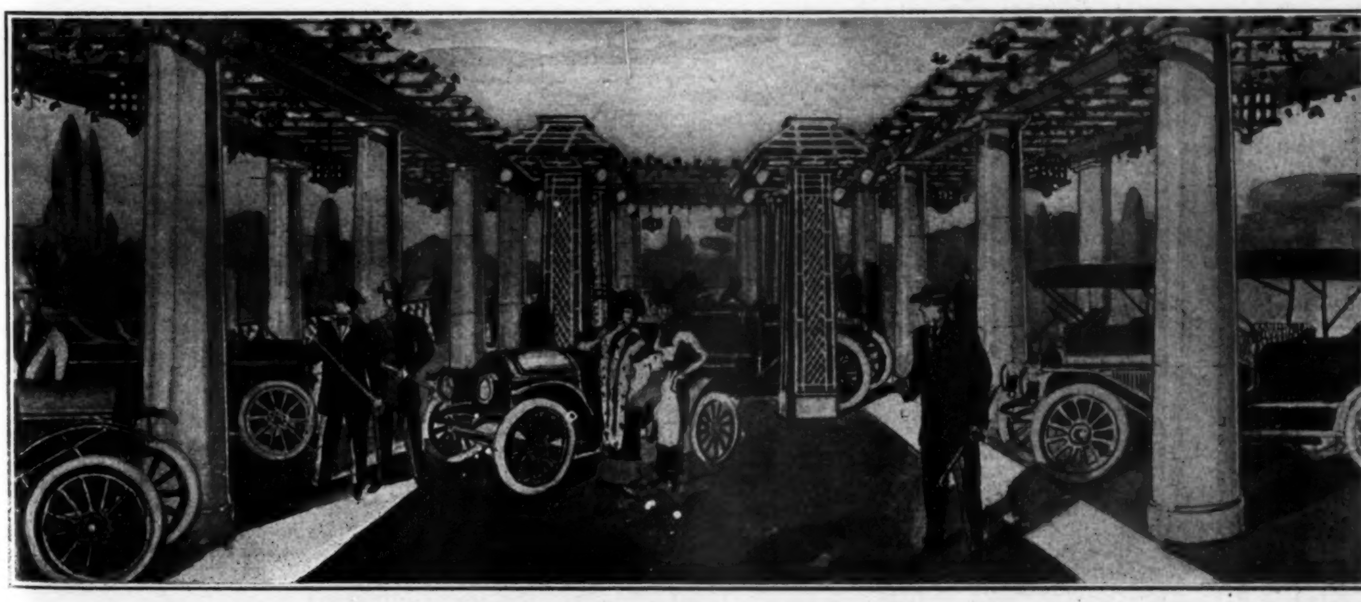
No.	Car	Driver	Time
	Free-for-all, class E, State championship, mile trial—		
1.	Stoddard-Dayton	De Hymel	1:02
2.	Cutting	Clark (withdrew)	
	Free-for-all, handicap, class B—		
1.	Cutting (scratch)	Clark	5:05 2-5
2.	Buick 10	Malone	....
3.	Cole 30	Endicott	....
	Stock chassis, class B, 300 cubic inches and less, 10 miles—		
1.	Cutting	Clark	6:14
2.	Cole 30	B. Endicott	....
3.	Cole 30	H. Endicott	....
	Stripped chassis, class E, Dallas Derby, 50 miles—		
1.	Stoddard-Dayton	De Hymel	56:10
2.	Cole 30	B. Endicott	....
3.	Cole 30	H. Endicott	....

Fitchburg Motorists Form Club

FITCHBURG, MASS., Oct. 28—A number of the prominent motorists of this city met last night and formed a motor club to be known as the Fitchburg Automobile Club. Addresses were made by several of the State officers. It is expected that more than one hundred motorists will join the club. It will become affiliated with the Massachusetts State A. A. The officers elected were as follows: F. O. Hardy, president; W. Powell, vice-president; G. Upton, secretary-treasurer. C. B. Smith was chosen representative to the State and national bodies. The following directors were also chosen: Henry McGrath, G. P. Grant, Jr., Gardner Hudson, F. R. Houghton and David Low.

Automobile Club for Haverhill, Mass.

HAVERHILL, MASS., Oct. 28—At a meeting held Thursday evening to form a permanent motor club at Haverhill to bear the name of that city, more than seventy owners of cars signed the roll. Then followed an election of officers with the following men chosen: W. W. Appleton, president; Dr. C. E. Durant, vice-president; F. S. Ball, secretary-treasurer; George E. Durgin, Dudley Hilliard, Elmer C. Bassett, Sam Jordan and John H. Bragdon, board of governors. Grant Fairbanks was chosen to represent the club at national and State meetings.



How the exhibition hall of Madison Square Garden will look after it is decorated in the style of an Italian garden for the Eleventh Annual A. L. A. M. Show, which is to be held January 7 to 12, 1911

Maxwell Wins Feature Race

FINISHED FIRST IN THIRTY-MILE EVENT OF MEET STAGED BY AUTOMOBILE CLUB OF WHITE PLAINS AT WESTCHESTER COUNTY TRACK

RUNNING with steadiness at high speed, a Maxwell car, No. 1, proved the feature of the race meet given Saturday afternoon at the Westchester County Fair grounds under the auspices of the Automobile Club of White Plains. The car finished first in the 30-mile event, winning from another Maxwell, an Allen-Kingston and two Mercedes, one of which has made creditable showings in two Vanderbilt Cup races.

The track was exceedingly trying to the heavy cars on account of its sharp turns and rough surface and the terrific strain on the right tires soon put them out of competition. The Maxwells, however, slipped along without trouble and were all alone at the finish on account of their light weight and the fact that no mechanic rode with either of the drivers.

A good crowd turned out to see the races, but wholesale scratching deprived the card of much of its interest. The best time trials were made by Mercedes, 4, driven by S. E. Wishart, 1:14 1-4; Allen-Kingston, 8, Ormsby, 1:21, and Maxwell, 1, 1:23.

The first race was won by Mercedes, 9, driven by H. Mendell, Jr., who covered the five miles in 7:09 1-2. Marion, 24, Thebaud, and Allen-Kingston, 8, Ormsby, also ran.

Maxwell, 1, Costello, had a cake-walk in the second, making the five miles in 6:44 1-5. Maxwell, 11, and Krit, 16, finished as named.

The third race failed on account of scratches and Mercedes, 9, and Marion, 24, contested in a match race, the former finishing the ten miles all alone after the Marion had suffered gear trouble. Chalmers, 18, was awarded the cup in the 20-mile event as the other contestants failed to show up. A 10-mile extra event was put on in its place and the Chalmers won the race from the two Maxwell entries.

The final number was the 30-mile feature event in which the two Maxwells, Allen-Kingston and the two Mercedes appeared at the scratch. Mr. Wishart's Vanderbilt Cup car jumped into the lead at the crack of the gun and within five miles had lapped the field twice when a gasoline feed pipe broke and the car lost five laps before temporary repairs could be made. In the meantime Maxwell, 1, had challenged the other Mercedes and had succeeded in getting to the front. From there to the finish the Maxwell remained in the van. Mercedes, 4, made quick repairs and started after the leaders but after four rounds was obliged to withdraw.

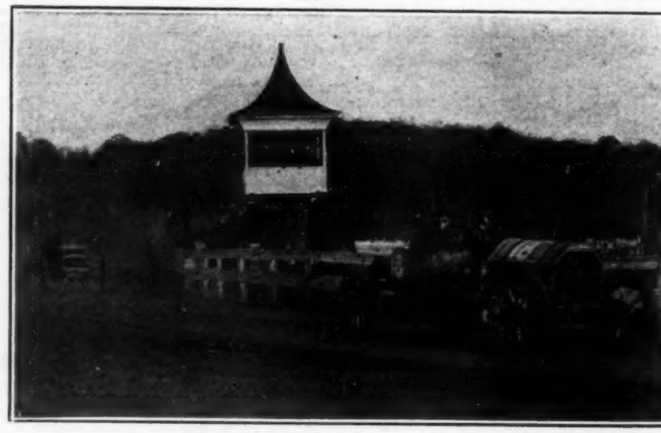
About the same time Mercedes, 9, swung into the stretch in trouble with its right tires and on the next round the Allen-Kingston drew out with the same trouble. The tires were worn almost to the inner tubes in each case. The Maxwells tin-canned along by themselves and completed the route in good order.

The track is thoroughly unfit for automobile races and the high speed made by Mr. Wishart's car courted fatal accident in every round.

Marion No. 24, which performed well at White Plains meet

Two Los Angeles Meets Announced

Two track meets, opening the Los Angeles motordrome for this season have been announced. The first of these will take place November 26 and 27, for which a varied program has been prepared. The first day will see six events decided. The first event will be mile speed trials; second, a pursuit race, restricted to four entrants; third, Class C, Division 3C, five miles; fourth, free-for-all, 25 miles; five, Class C, Division 2C, five miles; and six, the first hour of the Motordrome Endurance Derby of two hours, open to Class C. On the following day six more races will be held, mostly for larger cars.



Chalmers No. 18 leading in ten-mile event at White Plains

The second meet is a 24-hour race scheduled for December 25-26 for a Challenge Trophy and a purse of $1,500, divided into three moneys. Class C cars are eligible and special trophies will be awarded the winners in each of the divisions providing that there are two or more. The entry list is limited to 16. The meets are both fully sanctioned.

Newark Club Elbows Deep in Politics

Working with all its accustomed vigor and efficiency, the New Jersey Automobile and Motor Club is taking a prominent part in politics just at this time. The club is laboring for a decent automobile law in Jersey and has taken useful means of determining how each legislative candidate stands with regard to reasonable legislation on the automobile. The club has propounded a quiz to each candidate and has received replies agreeing to better laws from 79 of them so far. Essex County is the scene of m[illegible]ity and largely as a result of the club canvass, both the Republican [illegible]nd Democratic candidates have been pledged to remedial legislation.

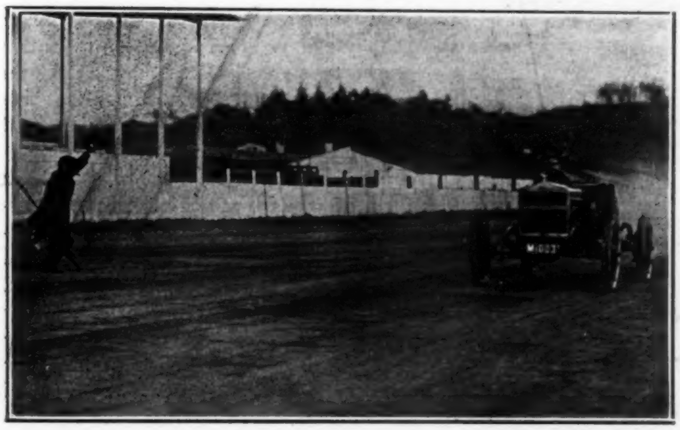
The club will take a distinct interest in the election at the polls. As its membership is tremendous, it will probably have a salutary effect.

Maxwell Wins Reliability Run

COMPLETES FIVE-DAY ROUTE WITH BUT 13 DEMERITS—AWARD PROTESTED BY ENTRANT OF WASHINGTON CARS

WASHINGTON, D. C., Oct. 28—For the second time this year a Maxwell, driven by H. E. Walls, won the sweepstakes in a reliability contest. The recent victory in the Munsey historic tour was repeated in the five-day reliability tour of the Washington *Post* to Richmond and return. A total of 13 points was marked against this car, three of them being for stalled motor and ten in the final examination.

The award was protested by A. G. Carter, entrant of one of the Washington cars, who claimed excessive penalties were laid against his car. Mr. Carter had an argument with B. B. Caverly, representative of the Contest Board, and the Washington entries were thereupon disqualified. The whole matter has been referred to the Contest Board for decision. The winners were Division 1A, Maxwell, B. Robertson; Division 2A, Buick, S. Mortimer; Division 3A, Maxwell, H. E. Walls; Division 4A, Washington, W. D. Arrison; Division 5A, Columbia, G. M. Wagner.



Maxwell on the starting line in White Plains time trials

The two Maxwells, two Washingtons and the Parry had perfect time scores. All the cars were perfect on the clutch test. The final examination report shows the following:

Buick.—Front wheels sprung three-quarter inch, 30 points; loose front gas lamp bracket, 2 points; time penalty, 52 points; road penalty, 15 points. Total, 99 points.

Washington.—Lost grease cup, left rear axle, 2 points; lost truss rod under rear axle, 25 points; foot brakes, 3 points; road penalty, 1 point. Total, 31 points.

Washington.—Loose left rear fender, 2 points; foot brake, 8 points; emergency brake, 10 points; road penalty, 2 points. Total, 22 points.

Columbia.—Two loose cap screws on exhaust and intake manifold, 2 points; one broken spring clip, left rear spring, 15 points; one broken truss rod under rear axle, 25 points; five leaves broken in right front spring, 25 points; five leaves broken in left front spring, 25 points; loose mud apron, 2 points; nut off transmission cover, 1 point; loose set nut on connecting link of throttle linkage, 1 point; brass binding on dash loose, 1 point; half inch of spread rear wheels, 20 points; foot brake, 46 points; hand brake, 26 points; road penalty, 22 points. Total, 211 points.

Maxwell.—Loose spark terminal, 1 point; loose yoke on steering column, 15 points; broken leaf in left front spring, 5 points; loose left hand short brake lever, 25 points; loose left front fender bolt, 2 points; one tappet rod spring loose, 1-2 point; one tappet rod spring lost, 1-2 point; one loose right hand front axle bolt, 2 points; two loose body bolts, 2 points; road penalty, 8 points. Total, 61 points.

Maxwell.—Fan belt off, 1 point; one lost cap screw from magneto distributor, 1 point; one loose cap screw from magneto distributor, 1 point; loose right rear fender, 2 points; two bent brake band brackets, 5 points; road penalty, 3 points. Total, 13 points.

Parry.—Loose right front fender, 2 points; loose rear right fender, 2 points; bent left front fender, 2 points; left front spring leaves out of line, 2 points; right front spring leaves out of line, 2 points; base of steering column loose at dash, 15 points; gasoline strap loose, 2 points; brake band guide bent, 2 points; stud loose on transmission cover, 1 point; truss rod on rear axle loose, 5 points; loose muffler, 2 points; front axle bent back, 150 points; spread of rear wheels, 95 points; emergency brake, 17 points; time penalty, 58 points; road penalty, 205 points. Total, 562 points.

Washington.—Loose left fender, 2 points; loose strut rod under rear axle, 5 points; loose right front deck, 1 point; loose right front fender, 2 points; spread of front wheels, 5 points; foot brake, 3 points; tire penalty, 625 points; road penalty, 328 points. Total, 971 points.

Buick.—Loose steering column, 15 points; loose sprocket on jack shaft, left side, 50 points; distance rod nut, left and right side, 2 points; foot brake, 30 points; time penalty, 8 points; road penalty, 2 points. Total, 107 points.

The heavy penalties earned by the Washington and Parry were due to accident. The summary:

			Final Standing			
Name of Car	H.P.	Driver	Time	Road	Tech.	Tot'l
Maxwell, ...	30	H. E. Walls, ...	0	3	10	13
Washington, ...	40	W. D. Arrison, ...	0	2	20	22
Washington, ...	40	A. G. Carter, ...	0	1	30	31
Maxwell, ...	14	B. Robertson, ...	0	8	53	61
Buick, ...	18	S. Mortimer,..........	52	15	32	99
Buick, ...	14	W. Angle, ...	8	2	97	107
Columbia, ...	28-30	G. M. Wagner, ...	0	22	189	211
Parry, ...	36	I. C. Barber, ...	58	205	299	562
Washington, ...	40	G. Halstead, ...	625	328	18	971

Santa Monica Road Races Announced

LOS ANGELES, Cal., Oct 31—Thanksgiving Day has been selected for holding the second annual Santa Monica Road races and the start will be at daybreak. The race is practically a triple attraction, for beside the free-for-all event there will be a light stock car and a heavy stock car competition which will precede the main contest.

In the light car class the limit has been placed at 250 cubic inches piston displacement without minimum weight restrictions and the course is 12 laps of a circuit 8.4 miles long. The entrance fees will be divided among the first three to finish in the proportion of 70, 20 and 10 per cent. The winner will be awarded the Leon T. Shettler trophy valued at $600.

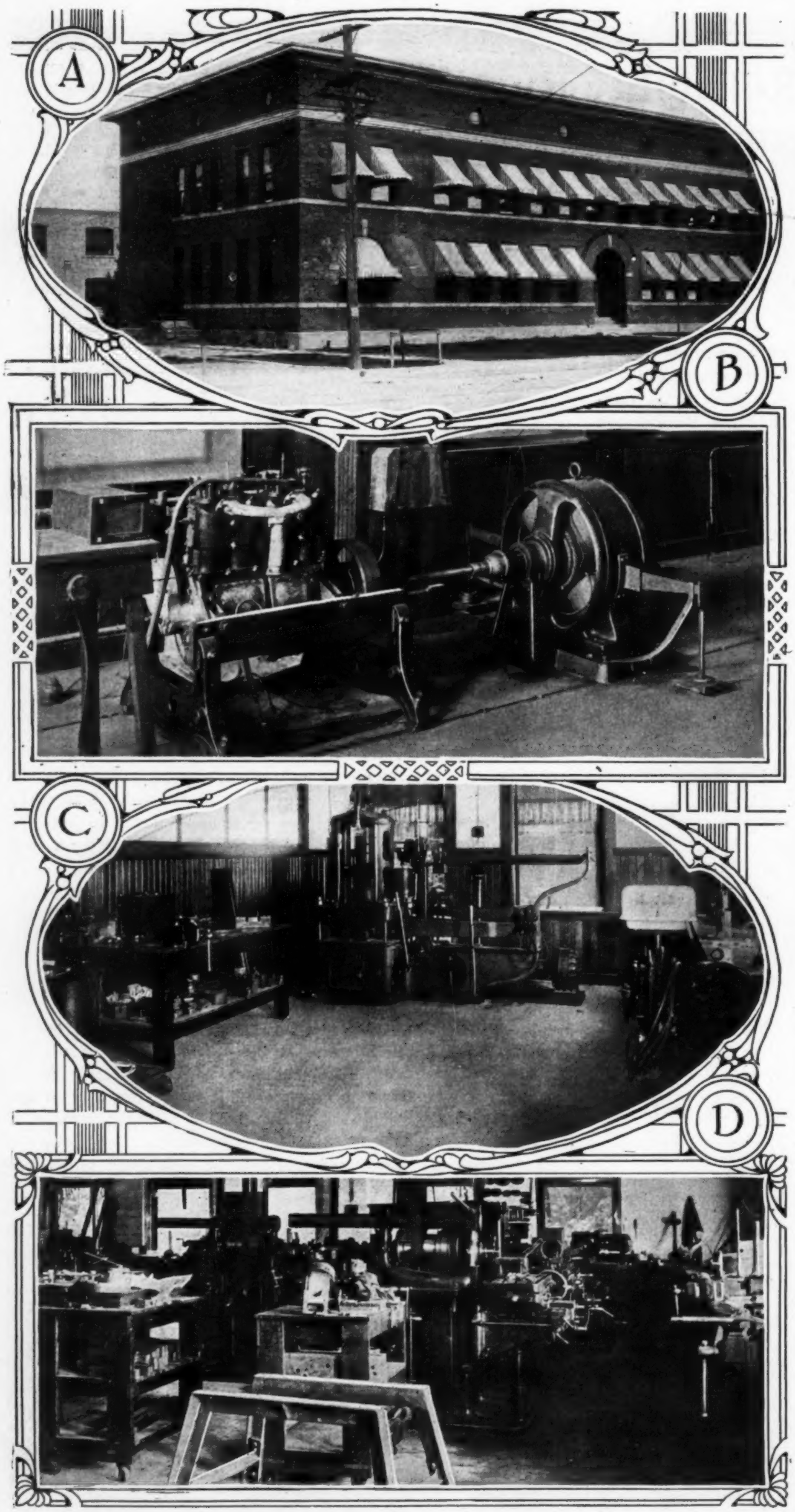
In the heavy stock car event, open to cars of 600 cubic inches displacement, the course will be 18 laps of the same circuit and the awards will be given on the same plan as in the foregoing. The Dick Ferris Trophy, worth $1,000, goes to the winner.

The main event is a free-for-all, 24 laps of the course and the prizes will be awarded according to the same plan.

The course is considered the fastest road racing surface in America. There are no difficult turns and no grades of any moment. In past contests light stock cars have made faster time than the big road locomotives that have competed in the Eastern cup races. This, of course, is due to the difference in the roads.

The events are sanctioned and will be conducted under the management of Dick Ferris.

Line up and start of third event of White Plains meet



The new Reo engineering building at Lansing, Mich., has been completed. It is three stories of reinforced concrete and has floor space of 31,200 square feet. The building is equipped with a particularly complete line of machinery capable of handling the smallest repairs or the construction of entire cars. Horace T. Thomas is in charge. A—View of engineering building. B—Motor testing laboratory. C—Material testing laboratory. D—Machine shop.

News of the Trade

DETROIT, MICH., Oct. 31—Saturday was moving day for the Hudson Motor Car Company. That is, it was the first of a series of moving days, for it will take all this week, it is expected, to complete the transfer of the company's stock and equipment from the old factory at Mack and Beaufait avenues to the magnificent new plant that has been under construction all summer out on Jefferson avenue and which is not yet completed. It is so near completion, however, that manufacturing operations can be carried on without hindrance and the officers of the company were anxious to move while the weather was still favorable.

A good start was made on the moving job, Saturday. The procession of motor trucks and vans started at 7 o'clock in the morning and continued without let-up all day. The parade was resumed this morning.

The new plant approximates a high form of modern motor car factory construction. Its ventilating, heating, lighting and sanitary arrangements are all strictly up-to-the-hour and are designed to give the maximum of comfort, safety and convenience. An instance of the consideration that has been shown for the employees is seen in the use of ribbed glass, which diffuses the light so that the glare of the sun cannot hurt the workmen's eyes.

Model Garage in Far Northwest

SEATTLE, WASH., Oct. 31—One of the most artistic, substantial and thoroughly fireproof garages in the Northwest has recently been completed at Baker City, Ore. It was erected by Albert Geiser, one of the most extensive property owners in that city, and will be occupied by him as the agent for the Buick automobiles in Baker County.

The building is centrally located on a lot 50 by 100 feet, built of natural stone, concrete floor and metal roof suspended by steel arches at a height of 20 feet.

Mechanical Engineers to Meet

Cement making, as it is affected by the rotary kiln, will be treated by Ellis Soper, of Detroit, at the New York meeting of the American Society of Mechanical Engineers, November 9. Charles Whiting Baker will deliver an illustrated lecture on the Panama Canal.

THE HUDSON COMPANY MOVES TO ITS NEW QUARTERS IN DETROIT—OTHER ITEMS OF INTEREST

The main building is 610 x 60 feet in dimensions, with one wing 410 x 60, and another 210 x 60. There is an office building, 180 x 52 feet. All the buildings are two stories in height, but are designed to carry two more any time it is found desirable. They are of reinforced concrete construction.

Sanitary drinking fountains are scattered throughout the buildings, while each of the employees will have a steel locker. The work benches are equipped with private metal drawers for the use of the bench hands, draftsmen, etc. Then there are rest rooms for the women, smoking rooms for the men and an employees' dining room.

Scores of devices for lessening the cost of production have been provided, and a great many of them have been specially designed by Howard E. Coffin, chief engineer for the Hudson Company, and designer of all the Hudson models. Among these features may be mentioned an overhead crane for conveying cars to the paint shop.

A 30,000-gallon tank, supported by a tower 135 feet high, affords fire protection. An automatic sprinkler system has also been installed.

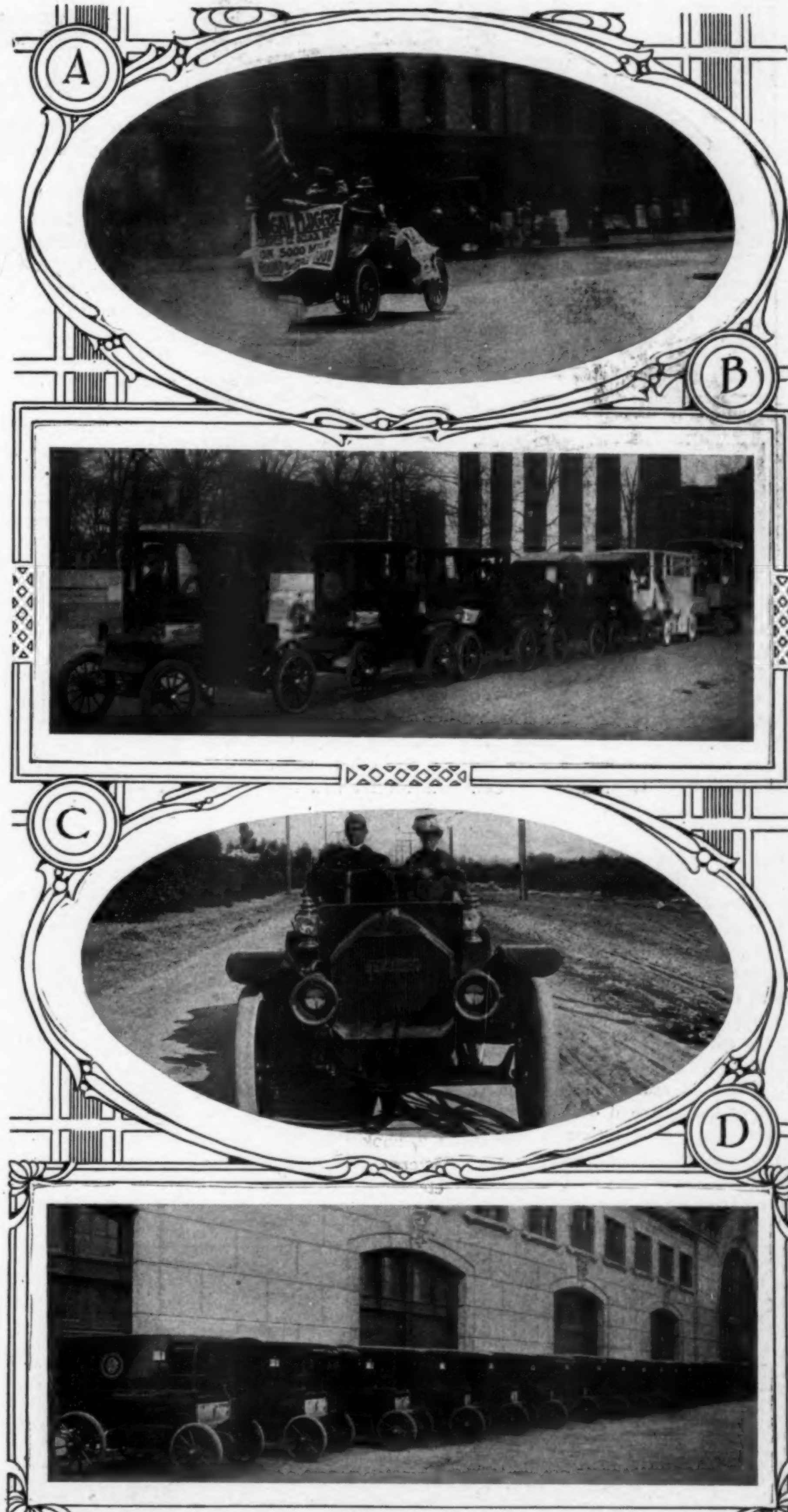
A feature of the plant is the experimental room, designed by and equipped under the personal supervision of Mr. Coffin. It has been termed a mechanic's paradise.

Larger Quarters for Studebaker

WILMINGTON, DEL., Oct. 31.—The Wilmington branch of the Studebaker Automobile Company, which is having a building erected for its use as an office and garage on Delaware avenue near Tatnall street, has decided to use all three floors of the building for its business, instead of only the first and second floors, as was the original intention.

Packard Company to Entertain

Celebrating the completion of factory additions which have been under construction for a considerable time, the Packard Motor Car Company will give a reception to the business men of Detroit November 3. For the convenience of the guests, the company will install a motor car service from the street car line to the factory buildings before and after the function.



A—The "Regal Plugger," that is now touring through the South giving a demonstration of its power and reliability. B—A string of electrics just turned out by the Waverley plant and ready for shipment. C—The great Western car is a favorite on the Coast—F. A. Beals and family driving on Highland Avenue, San Bernardino, Cal. D—Studebaker cars are replacing horses in many of the large commercial houses in New York

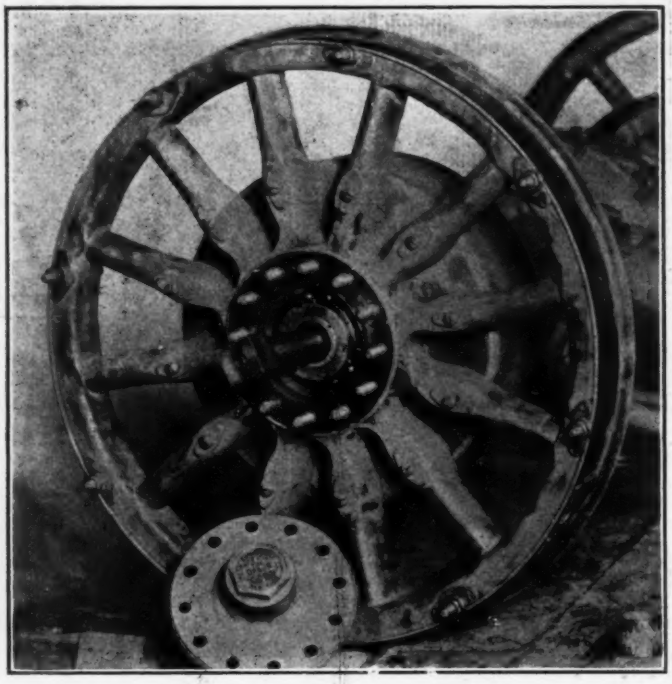


Fig. 1—Forged hub removed, showing driving square

Motor Activities in Hoosier Capital

INDIANAPOLIS, IND., Oct. 31—The Cole Motor Car Company has recently increased its capitalization and will build approximately 2,000 cars next season. The American Motor Car Company will increase its output to 400 cars and other concerns will similarly increase production. Contracts for the new season are coming in quite satisfactorily.

A number of changes in the trade have been made during the last few weeks. The Ford Motor Car Company is planning to open a factory sales branch in North Capitol Avenue, succeeding the Ford agency, which has been held by the Gibson Auto Company.

Plans have been completed for the factory building of the recently organized Great American Automobile Company, which will manufacture commercial cars exclusively, near the Indianapolis Motor Speedway. The Cecil E. Gibson Motor Car Company will also soon establish a plant for the manufacture of commercial cars.

The 1910 season has been a success locally. Almost every dealer has disposed of his allotment and is booking orders for 1911 cars. It is estimated that local dealers have sold about 3,000 cars this season, and present prospects would seem to warrant the assumption that 1911 will see these figures increased to the extent of at least 50 per cent.

Among the New-Comers

SOME time ago H. F. Kilbourn, president of the City National Bank, had a meeting with some of his Wall Street friends and it was then decided that good automobiles were too high-priced. The result of the meeting was that these gentlemen concluded to build their own automobiles and they engaged workmen and designers for the purpose, with the outcome that the first automobile is here. This car was made at the Brightwood plant at Springfield, Mass., and it is being demonstrated now in New York City to the edification of the men who braved the sea of possible failure in quest of a better automobile than can be made in the regular way.

The motor of this car is of the water-cooled, 4-cycle type, with cylinders cast in pairs, T-type, requiring two camshafts, and the crankshaft is centered on three bearings. Lubrication is by splash, with a pump to maintain a constant level. There is a

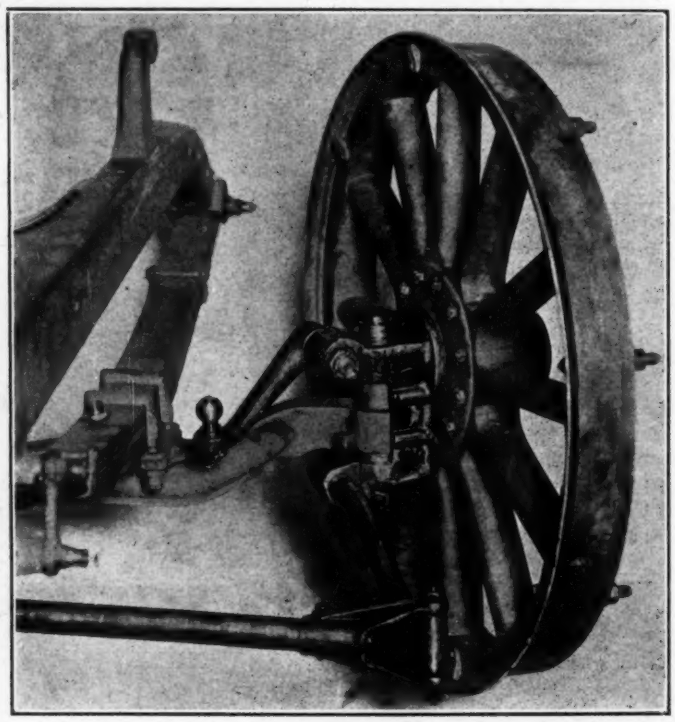


Fig. 2—Front axle and knuckle, depicting the steering arm and and cross-rod with liberal universal joints

tell-tale on the dash to tell the driver if the oil runs out. The cooling system comprises a honeycomb radiator, and water is circulated by a centrifugal pump, located on the exhaust side of the motor. A Stromberg, double-jet carbureter is used; the gasoline tank, holding about 20 gallons, is located back of the hind axle below the flush of the side bars. Ignition is by Simms magneto, using a separate high-tension distributor for the auxiliary (battery) system; the location of the magneto is on the right-hand side of the motor, which, by the way, is also the side that the carbureter is located upon.

The clutch is of the cone type with a leather facing. Transmission is through a selective three-speed gear, with an extra

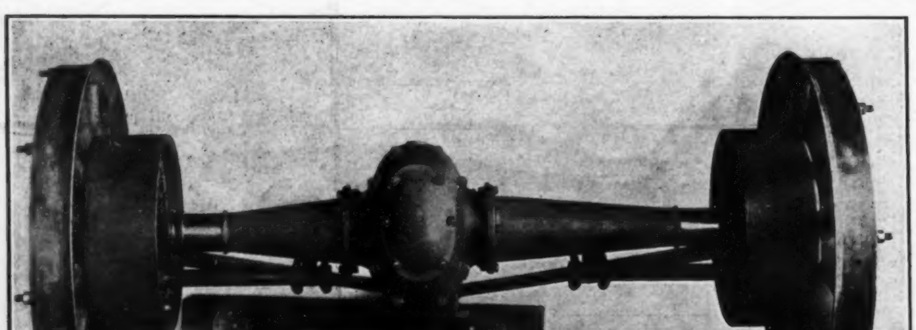


Fig. 3—Rear axle construction, showing a steel shell; large brakedrums and a stout bridge

ILLUSTRATING THE FIRST MODEL OF THE ORSON CAR; 100 BEING MADE FOR WALL STREET BROKERS; BANKERS ENTER AUTOMOBILE BUSINESS

speed change in the housing of the live rear axle. This is brought about by shifting the bevel pinion out of engagement with one of the two bevel gears used, and then engaging a second pinion with the remaining bevel gear—in other words, a double bevel drive is utilized.

The live rear axle is of the full floating type, with annular ball bearings, and the shell of the same is of drawn steel. The front axle is of the I-section alloy steel with thrust, as well as annular ball bearings in the knuckles. The brakes are of the internal expanding type in drums bolted to the rear road wheels. The side bars of the chassis frame are of the channel section with a 6-inch kick-up behind. The front springs are half-elliptic. The rear springs are of the three-quarter-elliptic type. Steering is by means of a ball-bearing worm and gear type. Control is to the top of the steering wheel, comprising spark and throttle levers. A pedal is used for acceleration. The wheelbase is 130 inches, and the tread is standard. The tire equipment is 920 x 120 millimeters front and rear. The weight of the car is said to be 2,750 pounds.

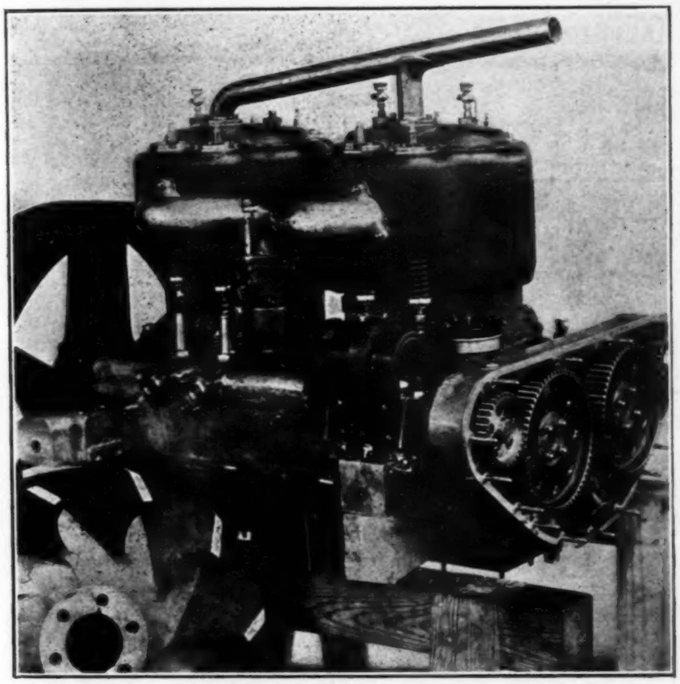


Fig. 5—Orson motor with gear wheel case removed and showing part of flywheel

The body is a 7-passenger, fore-door type, with an overhanging cowl, presenting a good appearance, and the plan of the company is to ultimately make and sell automobiles of this design at $4,500 for the stripped chassis, and $5,250 for the automobile with body as described above.

The outcome of this project is being watched with interest, as it is the first instance on record where automobiles in quantities have been designed and built by others than those actually engaged in the business.

Fig. 4—Rear brake drum, wheel, and details of holding brake mechanism

Moon Company Declares 64 Per Cent. Dividend

St. Louis, Mo., Oct. 24—At the annual meeting of the stockholders of the Moon Motor Car Company, held at the factory Thursday, a stock dividend of 54 per cent. and a cash dividend of 10 per cent. were voted. The stockholders decided to increase the capitalization from $162,500 to $300,000, the increase to be effected through the stock dividend of $87,000 and the issuance of $50,000 treasury shares. The treasury stock was taken immediately by the stockholders.

Mt. Vernon Club to Race Election Day

Election day has been selected by the Automobile Club of Mt. Vernon on which to run off the postponed fall race meeting of the club at the Empire City track. The meeting was scheduled for Oct. 22, but rain prevented its being held on that date.

Rambler Organization Tells Its Story

Telling the story of the growth and development of the Rambler, the Thomas B. Jeffery Company has issued a special number of the Rambler Magazine. A feature of the issue is the part devoted to the dealers themselves. A complete announcement of the 1911 line is included in the publication.

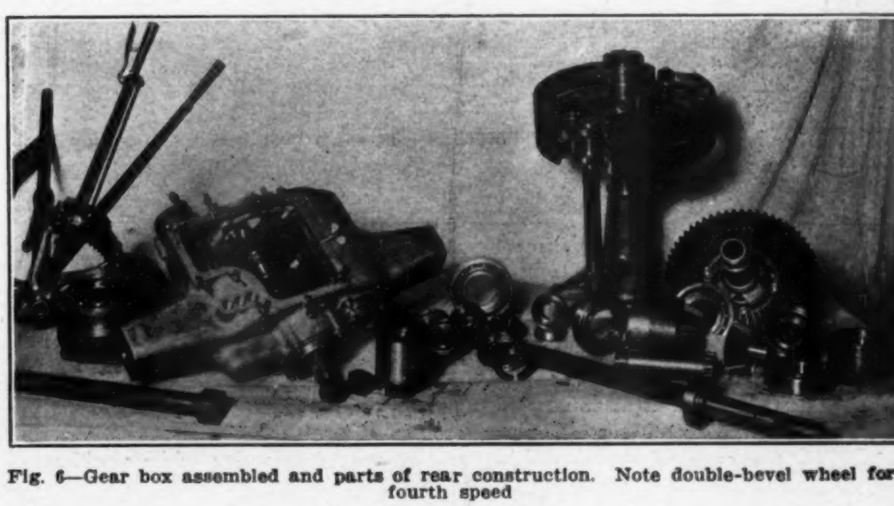


Fig. 6—Gear box assembled and parts of rear construction. Note double-bevel wheel for fourth speed

Prominent Automobile Accessories

GRAEF-ARTHUR STEERING GEARS

These gears are of the worm and nut type. By referring to Fig. 1 it is seen that the ball arm A is actuated by the rocking

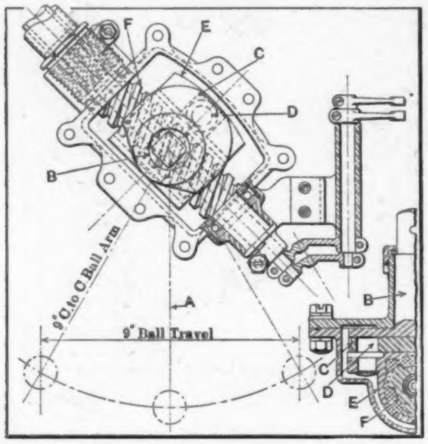


Fig. 1—Section in two planes of the Graef-Arthur steering gear, showing relations of the parts and nice construction

of the rocker-shaft B, by means of a long transmitting member C, pivoted to the eccentrically located stud-pin D on the long nut E.

Ball thrust bearings are provided at both ends of the worm. Adjustment for wear and assembly is provided on the worm F and the rocker B. The full thread of the nut is in engagement with the rocker at all positions of the ball arm.

The wearing surfaces cover very large areas, while all the operating parts move in oil and are completely enclosed against dust, foreign matter and leakages.

The gear case is so parted and jointed that the natural strength of the box is not impaired and without sacrificing strength, as can be seen from Fig. 1. All parts are made of machine steel and steel forgings, excepting the case, its cover and brackets.

Fig. 2—Packard twin cable

These gears are regularly made in two sizes; the smaller for cars up to 2,000 pounds in weight; the larger for cars up to 4,000 pounds in weight.

The small gear is fitted with outside control. The spark and throttle levers are located beneath the steering wheel.

Both designs operate upon identically the same principle, the difference being only in the size and disposition of parts and location of the control levers.

The gear is manufactured by the Cross Gear & Engine Company, of Detroit, Mich.

CABLE FOR ELECTRIC IGNITION

The accompanying illustration (Fig. 2) of a twin cable presents one of a line of electric conductors as used in the arts, and in view of the high-tension current used in automobile ignition work, the Packard Electric Company, of Warren, Ohio, is paying particular attention to the requirement. The company recommends that a No. 14 cable be used for tail and side lamps, No. 12 for headlights, and No. 10 for the leads from the battery to the controlling switch. These cables (six in all) are made up in both single and duplex conductor styles, the cores of which are composed of No. 30 tinned soft-drawn copper wire, carefully stranded, thus assuring the greatest measure of flexibility. The insulation on these cables consists of one layer of high-grade rubber compound. The single conductors are protected by a single grade of fine glazed thread in fast color, in characteristic seal brown, striped spiral each way with red, and saturated with flexible enamel exactly the same as used on Packard cables for electric lighting work. The two-conductor styles are made by placing two rubber insulated cores side by side without twisting, and braiding over them a common covering composed of fine glazed thread in fast colors.

Fig. 3—"Rist-Fit" driving mittens

GLOVES FOR THE COLD WEATHER

It is all very well for poets to say—"Blow! Blow, thou wintry wind." Such sayings are easy to pen in mid-summer, when the breeze is a necessity of life; but had that same poet been alive to-day and driven in an automobile with the wind blowing off snow-clad fields his lay would have been otherwise—perhaps: "Oh, for a pair of warm gloves!" What a driver wants on a cold day is a pair of gloves to keep his hands warm and allow freedom of movement for the fingers. The Rist-Fit gauntlet mitten shown in Fig. 3 combines these qualities, being made of best leather and lined with eiderdown, fleece, lambskin or fur. The forefinger is made separate and permits free action while working.

VALVE STEM ADJUSTER

The silent operation of the valves of a gasoline motor is, to a great extent, due to the amount of clearance allowed between the push rod and the valve stem, and in cars that are not provided with adjustments after a certain amount of wear has taken place the owner wonders why the engine has become noisy; and not only this alone, but the power shows a falling off. The Apco valve stem adjuster (Fig. 4) can be fitted to any motor and the required amount of lift can be given to the valves by placing inside the cap small disks under the stems. The Auto Parts Company, of Providence, R. I., makes this handy device.

Fig. 4—Apco valve stem adjuster

PUNCTURE-PROOF INNER CASE

There has been placed on the market a tire protector that can be inserted in any make of tire between the casing and the inner tube and into the construction of which has been introduced armor-plate steel disks. It is known as the Jelco Atlas puncture-proof inner case (Fig. 5). It consists of a rubber cushion, three rows of steel disks placed over one another in a manner similar to the scales of a fish and vulcanized in the rubber. The usual inner tube can be used, but one of 1-in. small diameter is recommended. The J. Ellwood Lee Company, of Conshohocken, Pa., guarantee these bands as "positively puncture-proof."

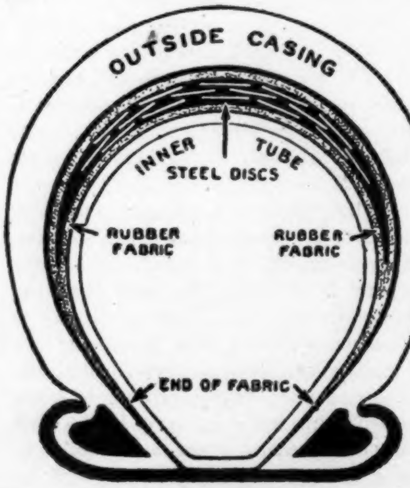


Fig. 5—Jelco Atlas puncture-proof inner case